Materials & Methods

THE MAGAZINE OF MATERIALS ENGINEERING

Nickel Plated Metals Have Wide Range of Uses

Spinning of Difficult Shapes Simplified by Use of Speed Chart

Aluminum Used Successfully in Precision Instruments

Methods of Machining Laminated Phenolic Plastics

Bright Annealing of Nickel Silver Accomplished on Production Basis

How Plastic Deformation Influences Design and Forming of Metal Parts

Materials at Work

Causes and Cures of Common Welding Problems

Fabricated Materials and Parts

Materials & Methods Manual No. 54

December 1949

It pays to use your custom molder's know-how

"Small" details, a big field for design improvement

No. 12 in a series on Plastics Skill at Work...

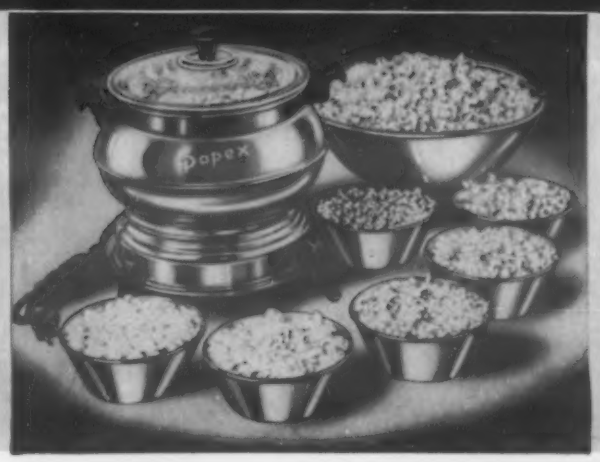
PROJECT:
Legs for new model "Popex" popcorn popper

CUSTOMER:
Popex, Inc., Blue Ash, Ohio

MOLDER:
Plastics Moldings Corp. Cincinnati

MATERIAL:
Durez black phenolic, general-purpose grades

BEFORE restyling, the Popex Electric Corn Popper stood on 3-piece metal legs. But Popex, Inc., executives recognized in this minor detail an opportunity for major improvement. With the objectives of neater appearance, less heat transmission and, if possible, lower costs, engineers of Popex, Inc, and Plastics Moldings Corp. cooperated in redesigning the leg as a plastics molding.



AFTER restyling, the leg was molded in one piece of Durez general-purpose black phenolic. The natural lustrous finish and smooth contours of the new piece make the appliance more attractive to buyers. Durez legs stay "cool" when the stove is hot . . . it's safer and easier to pick up. Cost is down: assembly of the three old-style legs took 19 operations, Durez legs are attached in only 6.

"Minor" features are not always *minor*. This before-and-after story of the legs supporting an electrical appliance illustrates how a small detail and the right Durez plastic can go a long way in making a product easier to sell, easier to use, and less expensive to produce.

Many articles used by industry or in homes offer improved design opportunities of the kind Popex, Inc., saw in the legs of their corn popper.

As often happens, success-insurance lay in joint effort. Custom-molders contribute a lot more than production facilities toward the success of the job. These molders recommended sections and contours providing the maximum strength with the greatest economy. Thus, by using Durez 791 general-purpose phenolic, which is used also for the handles and knobs, cost was reduced while sales appeal was added.

Durez phenolics offer your engineers and molders a very broad range of materials. These are grouped in eight classes corresponding to the field of use in which they will give the best service. Your custom molder knows how to choose the right one and how to use it.

Durez technicians in leading cities are always available for consultation. Call them . . . or write us at any time.

A new hit with plastics users everywhere is the handy "Durez Check-Chart." Write for yours. Durez Plastics & Chemicals, Inc., 1412 Walck Rd., N. Tonawanda, N. Y.

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

PHENOLIC PLASTICS THAT FIT THE JOB

The Materials Outlook

Aftermath of steel strike leaves business in much the same position as a convalescent . . . weakened as a result of severe illness, now improving steadily. . . . But the "bills" haven't been paid yet . . . and they may be a headache. . . . As mills settle down again to produce steel, they are faced with a sizable backlog in demand. . . . During tenure of strike, general manufacturing activity ran at high rate as long as stocks held out, plus the infinitesimal shipments obtained through small segments of industry. . . . But once inventories declined, production dropped badly. . . . Now pipe lines must be refilled and inventories replenished before pre-strike production levels are reached. . . . Operations can be restored quickly because of good preparation and maintenance of facilities during shutdowns. . . . But effects may hang on for some time due to tremendous demand . . . particularly in sheets, strips, and bars. . . . Voluntary allocation of certain products may be set up and kept in effect for next few months to offset potential drains on existing supplies.

Copper is riding a boom, partially engendered by recent steel shutdown as consumers switched materials for certain products in effort to stay in business. . . . Biggest push, however, has come from fear of further price rises and possibility of reduced supply if potential labor difficulties materialize. . . . Current building program is adding impetus, too. . . . Situation has been somewhat contrary to accepted patterns, since shutdowns in steel and coal should have had a throttling effect on copper demand by every rule in the book . . . particularly with cutbacks in automotive and electrical industries. . . . But despite all recognized maxims, the boom still booms.

Lead has not responded to the current activity in copper. . . . Liberal foreign offerings plus overall domestic supply situation has not spurred consumers into a rush for the metal, despite a wobbly price structure. . . . Battery-makers and paint producers are still buying in reasonably good quantities, but overall picture is far from what it was six or eight months ago . . . and won't be for some time to come.

Portending changes in present fabrication methods of firebrick, tungsten, and other extremely high melting point materials, a new electronic torch has been developed by General Electric. . . . High-frequency radio signals are combined with certain gases to achieve temperatures considerably in excess of 3400 C (6152 F). . . . Just emerging from the laboratory stage, the commercial possibilities of the torch are as yet unexplored. . . . But the news augurs well for producers and fabricators of hard-to-melt materials.

(Continued on page 4)

The Materials Outlook *(Continued)*

Transparent, translucent and opaque vinyl and acetate sheeting are being applied in an increasing number of applications . . . in both flexible and rigid forms. . . . Biggest jump in use has been in packaging, merchandising and advertising fields . . . but sizable gains are being made in a variety of other uses: TV filters, knitting bags, automotive windshield visors, and display boxes, to name a few. . . . And the perennials are still doing business at the same old stand: jeep side curtains, motorcycle windscreens, goggle lens, et al. . . . In this connection, the use of Lumarith, acetate of Celanese Corp. of America, as an aid to "blind flying" is of interest. . . . Student pilot wears goggles of one color plastic (for example, blue). . . . Windows of plane are covered with a contrasting colored plastic (in this case, yellow). . . . Pilot can see his instrument panel, but outside view is completely blacked out due to action of color waves. . . . Instructor, wearing no goggles, can see out of yellow windows to watch for obstructions. . . . Eliminates dangers and discomforts of learning "under the hood."

And speaking of aircraft, anticipated contracts for both civil and military expansion portend increased demand for aluminum sheet and castings. . . . Add to this the rise in use of the light metal for windows, collapsible tubes, office machinery, appliances, and sporting goods, and you have all the makings for a bigger and better aluminum boom in the months ahead. . . . Providing, of course, that labor difficulties and pricing schedules don't knock the props out from under.

Resumption of tin trading on London Metal Exchange last month after a lapse of nine years brought record-breaking premiums at the outset for prompt shipment of the metal . . . but lower prices for deliveries in future months. . . . Domestically, this produced few reverberations, since most consumers on this side of the water are looking to the RFC for a possible change in the tin price. . . . Meanwhile, Governmental stocks of pig tin are climbing . . . lending added vigor to consumers' demand for increased tonnage.

Brass and bronze forgings are increasing steadily in popularity, spurred on by improved techniques and widening acceptance by the consuming public. . . . For many products, this fabrication method is supplanting casting because of the resulting savings through better machinability and reduced material waste. . . . Typical of these forged products that were formerly cast are: coupling parts for gasoline hoses, combined shower heads and necks, valves, gage bodies, etc. . . . Fewer rejections, reduced finishing operations, better tolerances, and increased strength are more reasons for the switch. . . . Biggest potential boom for copper-base forgings is developing in television circles. . . . Most dramatic applications to date are forged fittings for TV transmission circuits. . . . Specially designed flanges join the 20-ft. sections of copper-housed coaxial tube, silicon bronze bolts replacing the plated steel bolts formerly used which failed because of corrosive attack.

Reported savings in steel fabrication as high as 30% are promised by new extrusion process developed by the Société d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electrique d'Ugine. . . . New technique claimed to make it possible to handle steel like a plastic material, extruding in a hydraulic press the most intricate forms and sections. . . . Forging and machining operations are said to be eliminated. . . . Finished gears of alloy steel are claimed Ugine method. . . . Process could result in widespread revamping of our present production methods if claims bore up under U. S. manufacturing loads and to have been made in two operations by the conditions.

This "*INCONEL*" spring holds its temper — to help keep things cool!

NOT LONG AGO, the engineers at RANCO, INC., Columbus, Ohio, came face to face with a challenge.

What they needed was a metal for a guard spring. Its job: to protect capillary tubes on Ranco refrigeration controls from vibration and damage.

A simple enough job — one that could be done satisfactorily by several metals you can name offhand.

But Ranco's problem went deeper. Basically, it was a matter of design — design for economical production. *With the right metal, they could assemble a complete unit in a single operation.*

And to do that, the spring, as part of a sub-assembly, had to pass through a brazing furnace during manufacture. Most metals would have been seriously weakened in the process.

Of all the alloys tested, only Inconel* had the combination of properties needed to withstand brazing oven heat — and hold its shape and temper. The Inconel spring is tough — never-rusting — long-lasting. On both high- and low-pressure Ranco controls, it absorbs vibration, protects the capillary tube and keeps it firmly in place.

Other nationally-known manufacturers, too, have found that Inconel and the other versatile INCO Nickel Alloys can solve difficult design problems. They help reduce or eliminate manufacturing operations; they make products work *better* and serve *dependably.*

Can they do the same for *your* product? It's easy enough for you to find out. Write and tell us what the problem is — and get our suggestions. No obligation, of course. *Reg. U. S. Pat. Off.

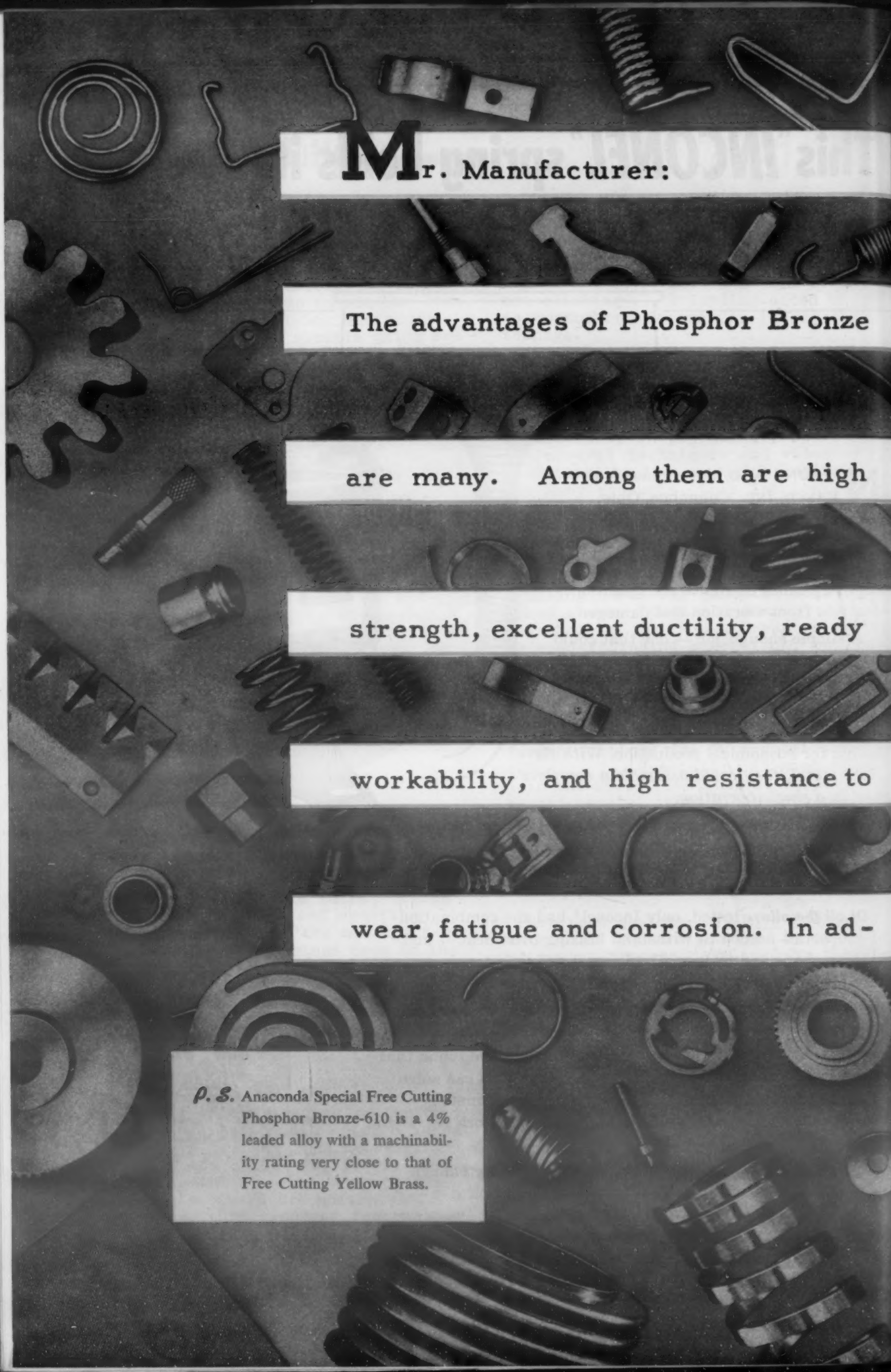
THIS LOW PRESSURE (20" vacuum to 50 pounds) refrigeration control is made by Ranco, Inc., who also manufacture other high pressure (100 to 350 pounds) models. Inconel guard springs are employed to damp vibration and prevent excessive bending of the tubes.

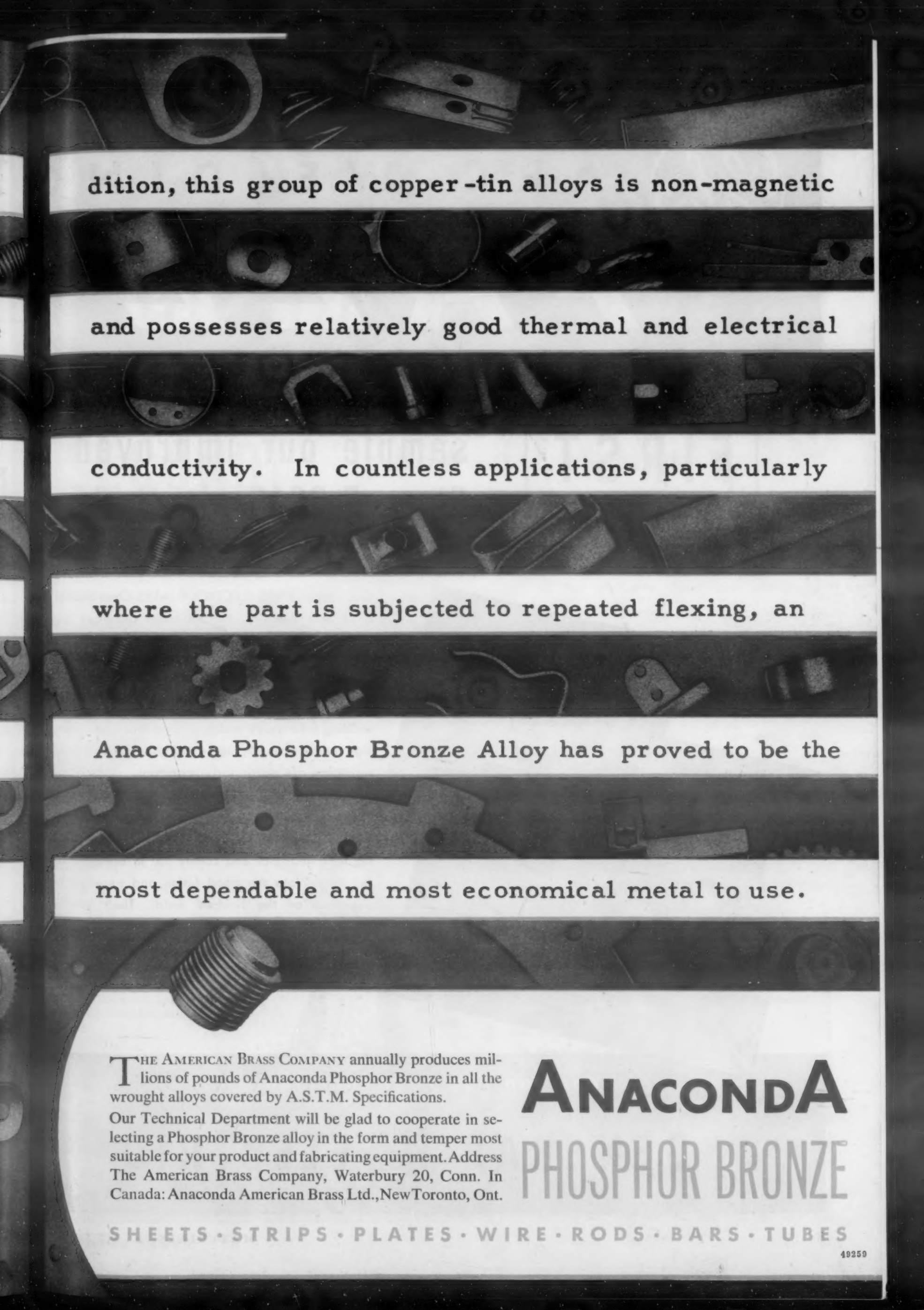
EMBLEM OF SERVICE

INCO
TRADE MARK

Monel* • "K"* Monel • "R"* Monel
"KR"* Monel • Nickel • "D"* Nickel
"L"* Nickel • "Z"* Nickel

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall Street, New York 5, N. Y.*


Mr. Manufacturer:
The advantages of Phosphor Bronze
are many. Among them are high
strength, excellent ductility, ready
workability, and high resistance to
wear, fatigue and corrosion. In ad-
P. S. Anaconda Special Free Cutting Phosphor Bronze-610 is a 4% leaded alloy with a machinability rating very close to that of Free Cutting Yellow Brass.



dition, this group of copper-tin alloys is non-magnetic and possesses relatively good thermal and electrical conductivity. In countless applications, particularly where the part is subjected to repeated flexing, an Anaconda Phosphor Bronze Alloy has proved to be the most dependable and most economical metal to use.

THE AMERICAN BRASS COMPANY annually produces millions of pounds of Anaconda Phosphor Bronze in all the wrought alloys covered by A.S.T.M. Specifications.

Our Technical Department will be glad to cooperate in selecting a Phosphor Bronze alloy in the form and temper most suitable for your product and fabricating equipment. Address The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

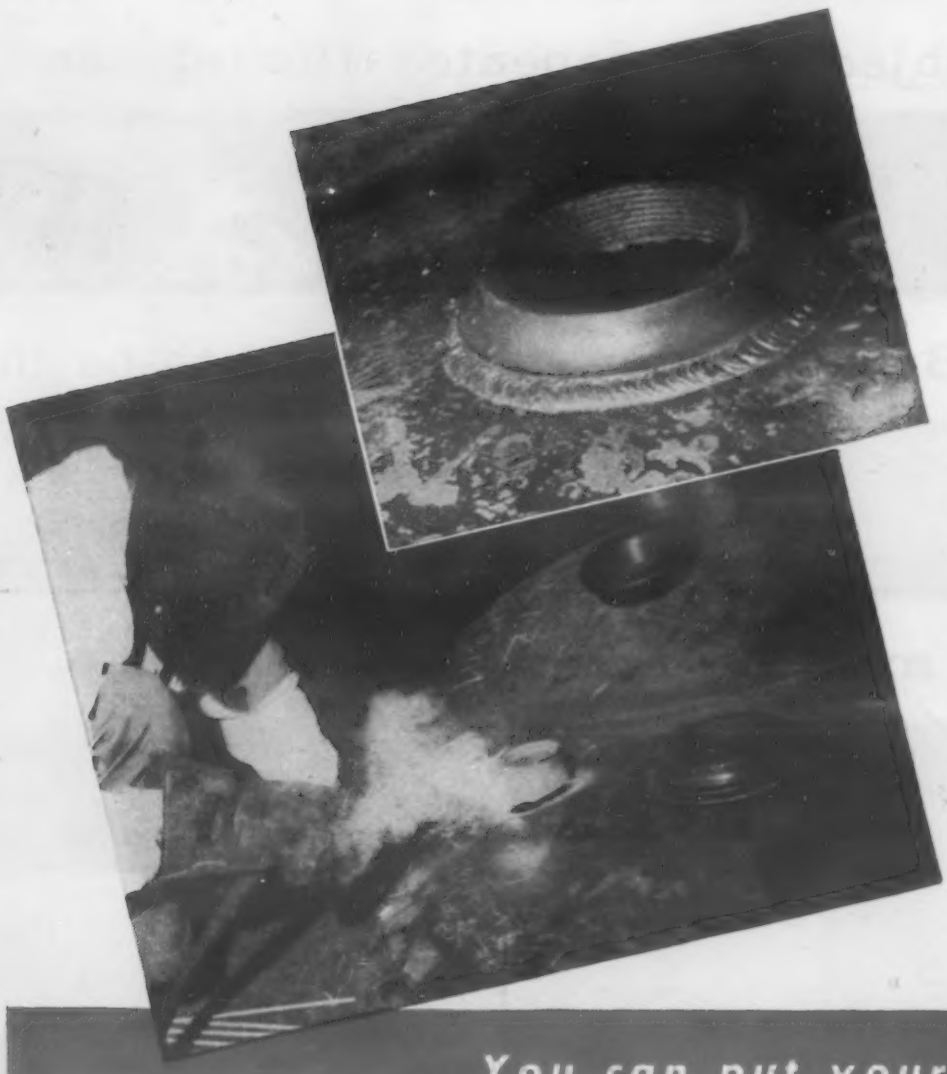
ANACONDA
PHOSPHOR BRONZE

SHEETS · STRIPS · PLATES · WIRE · RODS · BARS · TUBES

49259

ARC-WELDING FREE

FIRST sample our improved Class E-6010 electrode



G.E.'s NEW W-22 ELECTRODE (AWS Class E6010) is a reverse polarity d-c rod that produces high-quality welds in *all* positions. Its steady, spray-type arc is easily controlled . . . with little spatter, and excellent penetration.

This electrode is ideal for vertical and overhead welding jobs where welds of excellent appearance, high tensile strength, high ductility, and good impact resistance are particularly important.

The new W-22 has already proved itself in production tests . . . such as that at the Vulcan Steel Tank Company at Tulsa, where it was used in welding tank heads or end covers 36" in diameter and ¼" thick. Note the good fusion and excellent appearance of the finished welds. Their Welding Superintendent reports this electrode has the most forceful yet easily controlled arc he has ever seen.

You can put your confidence in

GENERAL ELECTRIC

ELECTRODES

combination offer

SECOND ...new G-E welding electrode comparator

Here's all the electrode comparison information heretofore available only on large, unwieldy charts—condensed into a handy, pocket-sized slide-rule. Naturally, it includes all G-E electrodes—mild-steel, special alloys, low-hydrogen, stainless-steel, hard-surfacing, etc.; and it covers the standard electrodes of all principal manufacturers—all suitably keyed to AWS classification numbers. And it's easy to use . . . just set the rule, and read off the comparison data directly. You'll find it the handiest means of comparing electrodes you've ever come across.

Clip the coupon for your free copy of the new G-E welding electrode "Comparator."

And here's a special bonus! Mail the coupon today, and we'll also send you a copy of the brand new edition of the pocket-sized G-E Arc-welding Electrode Catalog!

ARC WELDERS

ELECTRODES

ACCESSORIES • RENEWAL PARTS

Copyright 1949 General Electric Co.

MAIL TO YOUR G-E WELDING DISTRIBUTOR

. . . or to Sect. C712-2, Apparatus Department, General Electric Co., Schenectady 5, N. Y.

Send me the following:

( ) Free sample of W-22 electrodes

( ) Welding Electrode Comparator slide rule

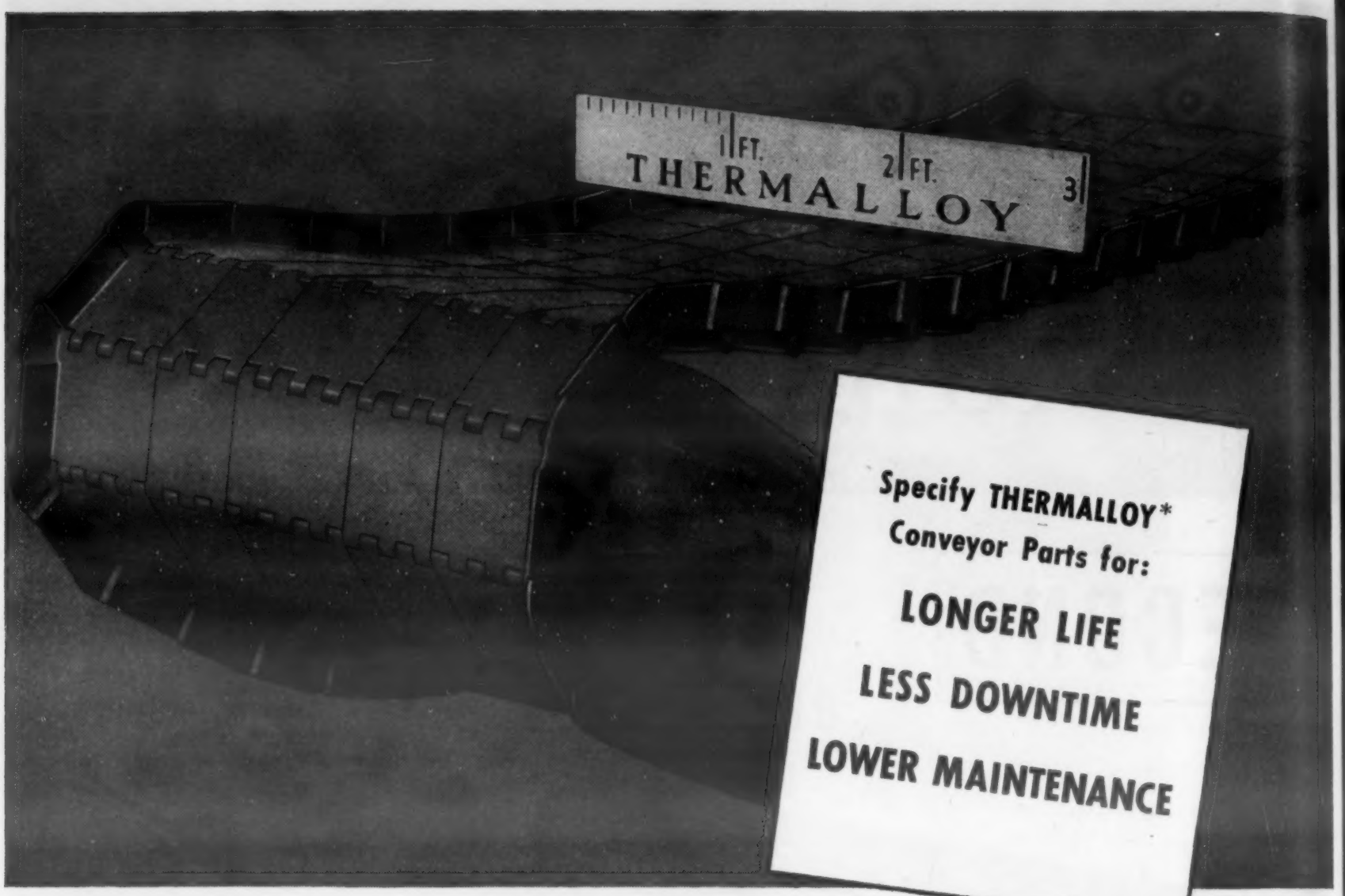
. . . and a copy of new electrode catalog, GEC-482

Name.....

Company.....

Address.....

City..... **State**.....



Looking For An Answer to Heat-Treat
CONVEYOR TROUBLES?

If you're bothered by these conveyor troubles:

- *Jumping the sprockets*
- *Pins "crank-shafting"*
- *Frequent replacement of defective links*
- *High maintenance cost*

. . . you'll find such troubles can usually be traced to improper engineering or inspection of the original conveyor parts.

For example, if dimensions on individual castings are not accurate, the driving drum or sprocket will exert an unequal pull on each line of links. This causes stretching. Pins often "crank-shaft". . . causing belt to "ride" on top of driving drum lugs, instead of engaging properly. This results in fracture of individual links and increased maintenance costs.

The cure for such troubles rests on careful engineering and production. Individual castings must be identical in length—so the belt will engage properly with driving drum, and no one link will be overstressed. Good design also provides close spacing between links for carrying small parts . . . and allows sufficient clearance to eliminate excessive wear.

Electro-Alloys has made a specialty of the precision engineering and production techniques required to produce conveyor belts of outstanding quality. We can show you *proof* that THERMALLOY high alloy conveyor parts give longer life, cut downtime and maintenance costs.

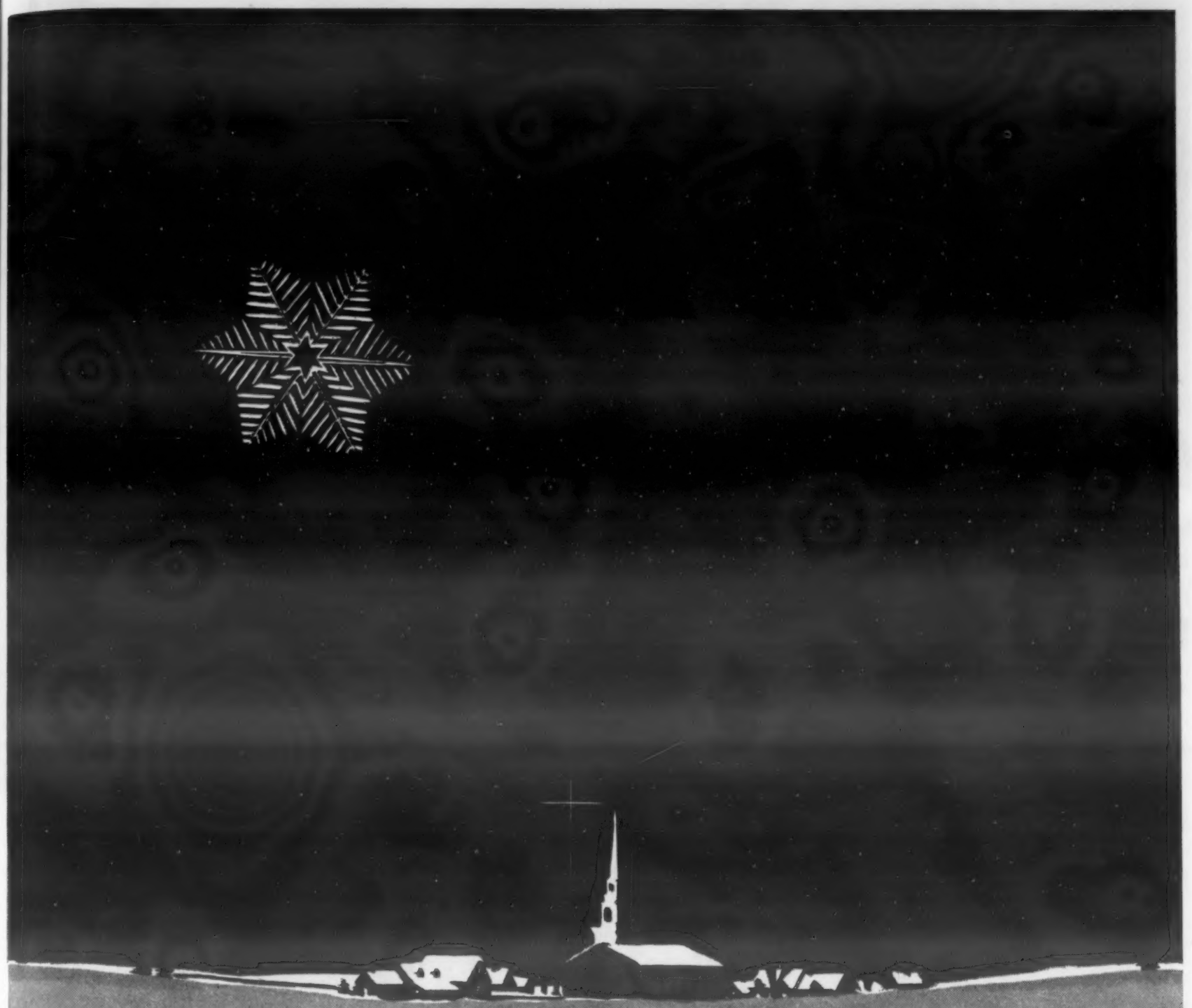
Call your nearest Electro-Alloys engineer. Or write Electro-Alloys Division, 1985 Taylor Street, Elyria, Ohio.

THERMALLOY resists temperatures up to 2200° F.

*Reg. U. S. Pat. Off.

AMERICAN Brake Shoe COMPANY

ELECTRO-ALLOYS DIVISION
ELYRIA, OHIO



Season's Greetings

and Best Wishes for the

NEW YEAR

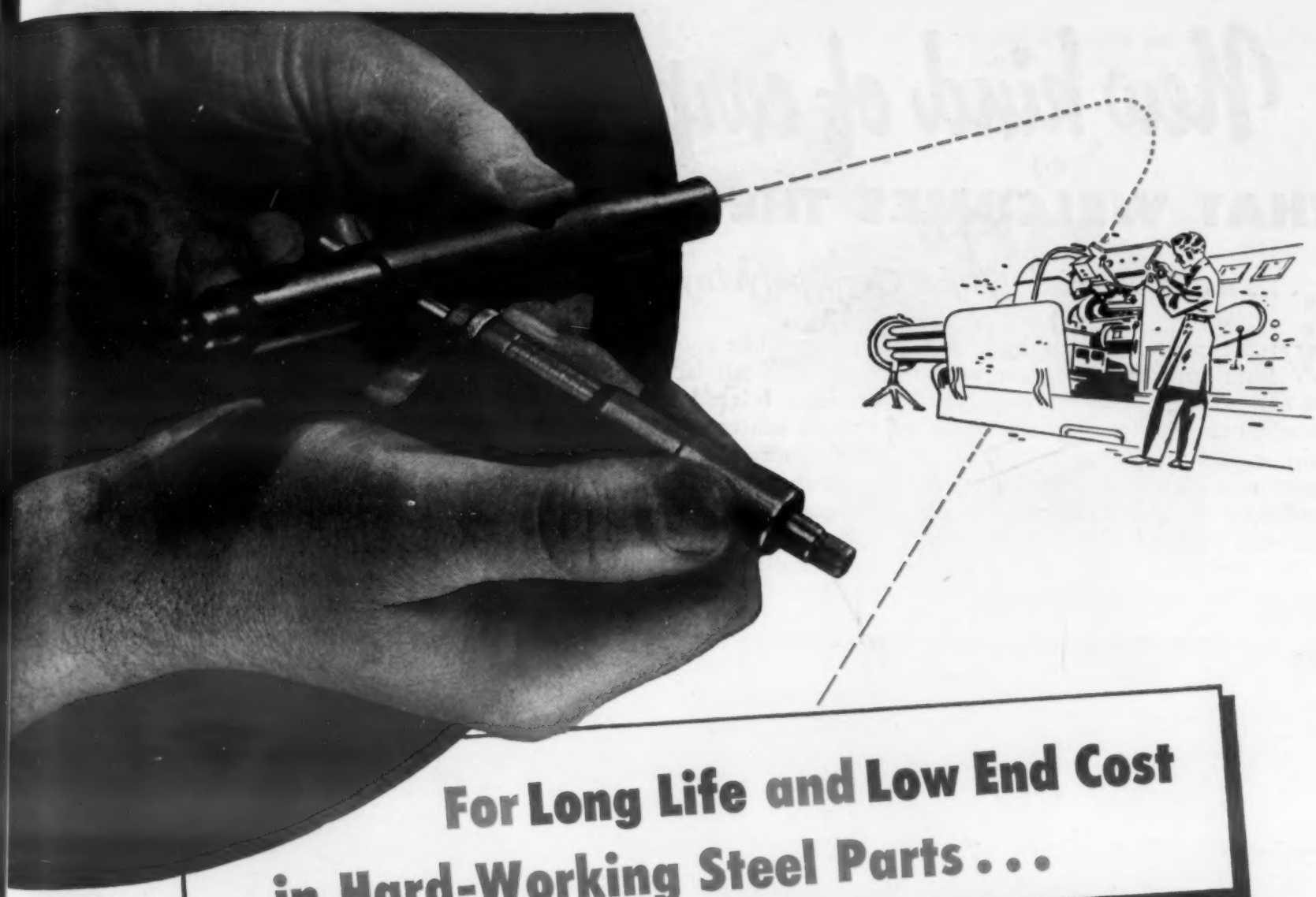
UNITED ENGINEERING AND FOUNDRY COMPANY

PITTSBURGH, PENNSYLVANIA

Not a planned test but an actual occurrence. The boxed area in the inset photo of the house indicates the area shown in the overall photo.

LEAD, the most durable of the common metals, imparts its imperishable qualities to its derivative, white lead—the pigment which has protected and beautified buildings for centuries. While *all* paint will deteriorate under the attack of time and weather, white lead paint is the most durable. The U. S. Department of Agriculture, in its publication, "Consumers Guide," has this to say of pure white lead paint: "This paint remains the best choice for home owners *who wish to allow very long intervals, longer than the durability of any other white or tinted paint,* to elapse between paint jobs." The significance of this advice lies in the fact that, since labor costs constitute 80% of the cost of any painting job, white lead provides the most protection at less cost. Conclusive testimony on this point is also provided by the specifications of the U. S. Government which call for either pure white lead or paints containing substantial amounts of white lead on all outside white lead and light tinted paints for general use. • Rarely is the superiority of pure white lead paint over low grade paint so graphically illustrated as in the photo above. This is a double house in a Philadelphia suburb. Both sides were painted with white lead originally and both offered good repaint surfaces. Two years ago both sides of the house were repainted. The owner of the house on the right again used white lead and the excellent condition of the paint two years later is readily visible. The other owner decided to try a cheaper, lead-free paint. Is pure white lead paint more beautiful, durable and economical? The photograph tells the story.

ST. JOSEPH LEAD COMPANY
250 PARK AVENUE *ELdorado 5-3200* NEW YORK 17
THE LARGEST PRODUCER OF LEAD IN THE UNITED STATES



For Long Life and Low End Cost in Hard-Working Steel Parts . . .

. . . use *Republic* Cold Drawn Alloy Steel Bars

LONG LIFE—Because Republic Alloy Steels provide these long-proved advantages: (1) High strength to carry heavy loads; (2) Toughness to withstand severe shock and strain; (3) Uniform response to hardening treatment that produces hard bearing areas.

LOW END COST—(1) Because the long life of steel parts made of Republic Alloy Steels means fewer repairs and replacements—less maintenance expense—more operating time and less down-time. (2) Because these bars provide the UNIFORM MACHINABILITY, accuracy of section, close tolerances and fine surface finish for which Union Cold Drawn Products are so well known—and which means lowest possible parts production costs.

Republic Cold Drawn Alloy Steel Bars are available in all popular analyses, in standard shapes and sizes, furnace treated as you desire—annealed, normalized, spheroidized, stress relieved or carbon corrected. Republic metallurgists are ready to help you get the results you need. Write for further information.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic COLD DRAWN
REPUBLIC STEEL
REG. U. S. PAT. OFF.
ALLOY STEEL BARS

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

New kind of carpet

THAT WELCOMES THE CROWD!

. . . another triumph for Geon polyvinyl materials

WHERE many feet go back and forth across carpeting, the problem of wear and upkeep is costly. Now Geon, the amazingly versatile polyvinyl resin, makes possible a new kind of carpet that gives you everything you need in the way of comfort, good looks, plus extra wear and simplified cleaning.

This new-type floor covering consists of sheeting made from Geon and embossed like loop pile carpet, with a cushion of cellular sponge rubber for resilience. It is proving a boon in stores, doctors' offices, playrooms—wherever there is heavy traffic, yet high standards of decoration must be maintained.

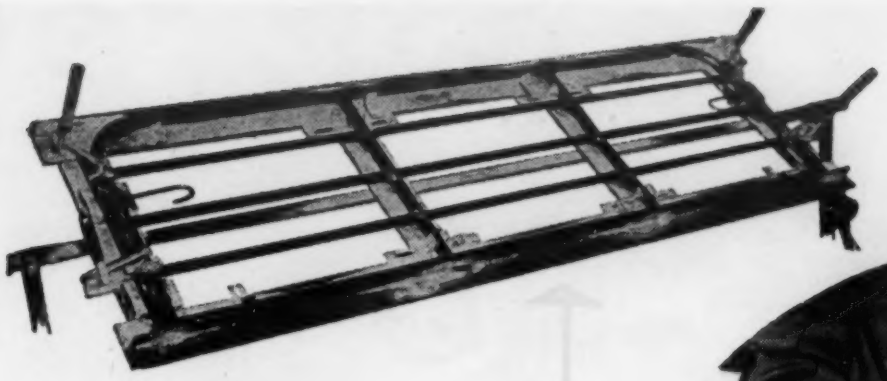
Because it is made of Geon, it wears superbly, comes in a wide color range, including pastels. It resists oil, grease and fights abrasion. It can be washed, mopped or vacuumed quickly. It comes in rolls and can be installed as easily as any floor covering.

Here is another example of Geon's amazing range—it can be used to make delicate dolls' heads, fire-resistant upholstery, beautiful draperies, raincoats. There seems to be no end to the uses for Geon polyvinyl materials. Geon literally sparks new ideas—more saleable products.

We do not make any finished products from Geon polyvinyl materials but our technical service is always glad to work with you any time in helping you develop new uses or a new adaptation for Geon. For further information, please write Dept. R-12, B. F. Goodrich Chemical Company, Rose Bldg., Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers



Safety slide for hospital bed. 42 half-inch long tack welds plus 6 continuous welds are made on .042" cold rolled steel in 23 minutes, including assembly time.

SIMMONS
STEEL FURNITURE
is Bronze Welded

Bedside cabinet. 2 reinforcing welds, 2 inches long, are made on 20-gage cold rolled steel in 54 seconds.

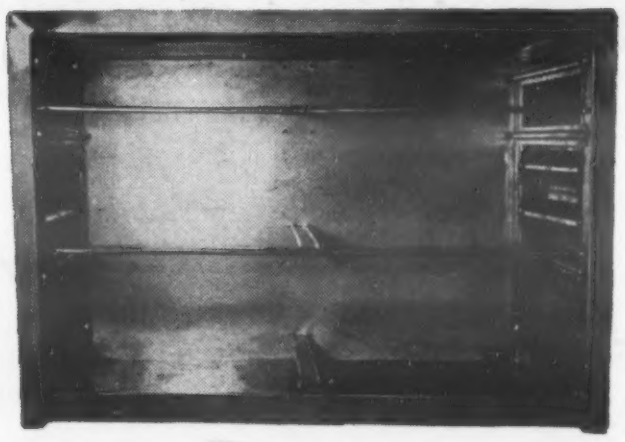
PRODUCT IS STRONGER

ASSEMBLY IS FASTER

COSTS ARE LOWER

COMPARATIVE SAVINGS:
Using ANACONDA 997 (Low Fuming) Bronze versus steel welding rod on same operations

40 to 60%



Steel dresser. 36 welds are made on 20- and 22-gage cold rolled steel. Total time, including assembly, is less than 6 minutes.

The Simmons Company adds: "Under actual testing, we have a much stronger unit today than if we were using steel welding, due to the fact that the lower bronze-welding temperatures do not weaken the joint areas."

If you do either production or repair welding, write for Publication B-13. It covers *all* ANACONDA Welding Rods, their applications and procedures for their use. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 49157

Steel chair. 56 ANACONDA 997 (Low Fuming) Bronze welds are made on each chair, with components aligned in welding fixture.

You can depend on

ANACONDA

New Movie Now Ready

Camera crew on location filming the electric-furnace sequence for industrial motion picture, "Alloy Steels"

"ALLOY STEELS"

Film Story of Controlled Production of Alloy and Special Steels

Bethlehem has completed a sound motion picture describing the production of alloy steels.

The film explains every phase of the process, beginning with the raw materials. It shows both electric and open-hearth furnaces in operation, as well as hot-rolling, billet preparation, heat-treatment, and cold-drawing. It deals extensively with highly-developed laboratory methods for maintaining quality on a mass-production basis.

"Alloy Steels" is intended for both technical and general audiences. It takes 45 minutes to show, and is available in either 16 or 35 mm. It is especially suitable for showing before such groups as:

Manufacturing and Industrial Companies
Jobbers and Dealers
Civic and Service Clubs
Colleges and Technical Schools
Technical Societies and Trade Associations

There is no charge for the use of *"Alloy Steels"* other than return shipping cost. Requests should be made at least three weeks prior to date needed. Address your requests to:

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

Steel-Weld FABRICATION

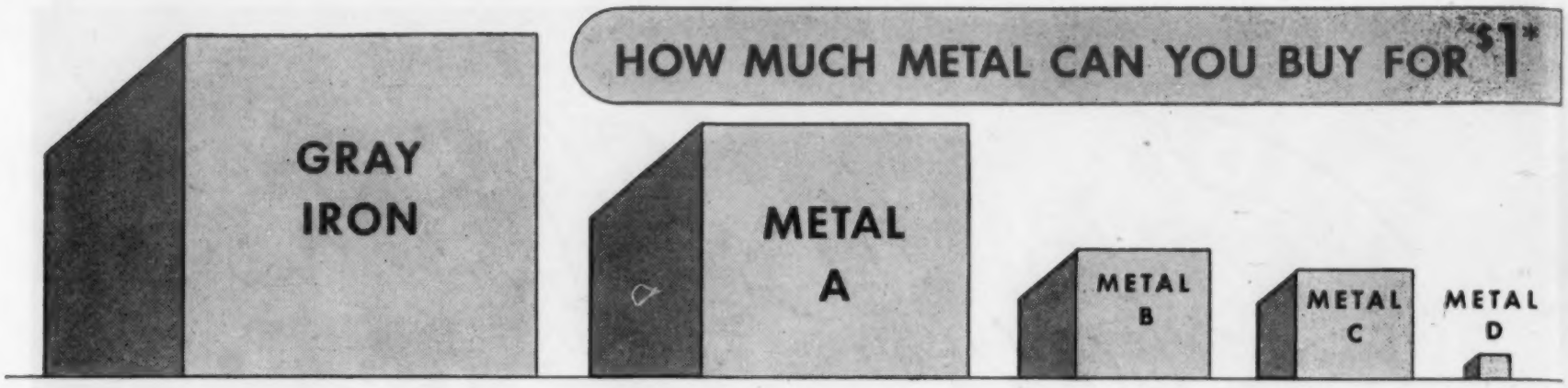
This 24 inch main pivot journal bearing, formerly produced in casting form, was redesigned by Mahon engineers for Steel-Weld Fabrication. It is typical of thousands of heavy machinery parts and assemblies produced by Mahon for manufacturers throughout the country. Whatever your requirements may be, regardless of size or weight, you will find in the Mahon organization an unusual source for welded steel in any form . . . a source with complete machining facilities, and a staff of design engineers and craftsmen from whom you may expect a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY

DETROIT 11, MICHIGAN

Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

MAHON



ECONOMY is one of 11 reasons why GRAY IRON LEADS THE FIELD!

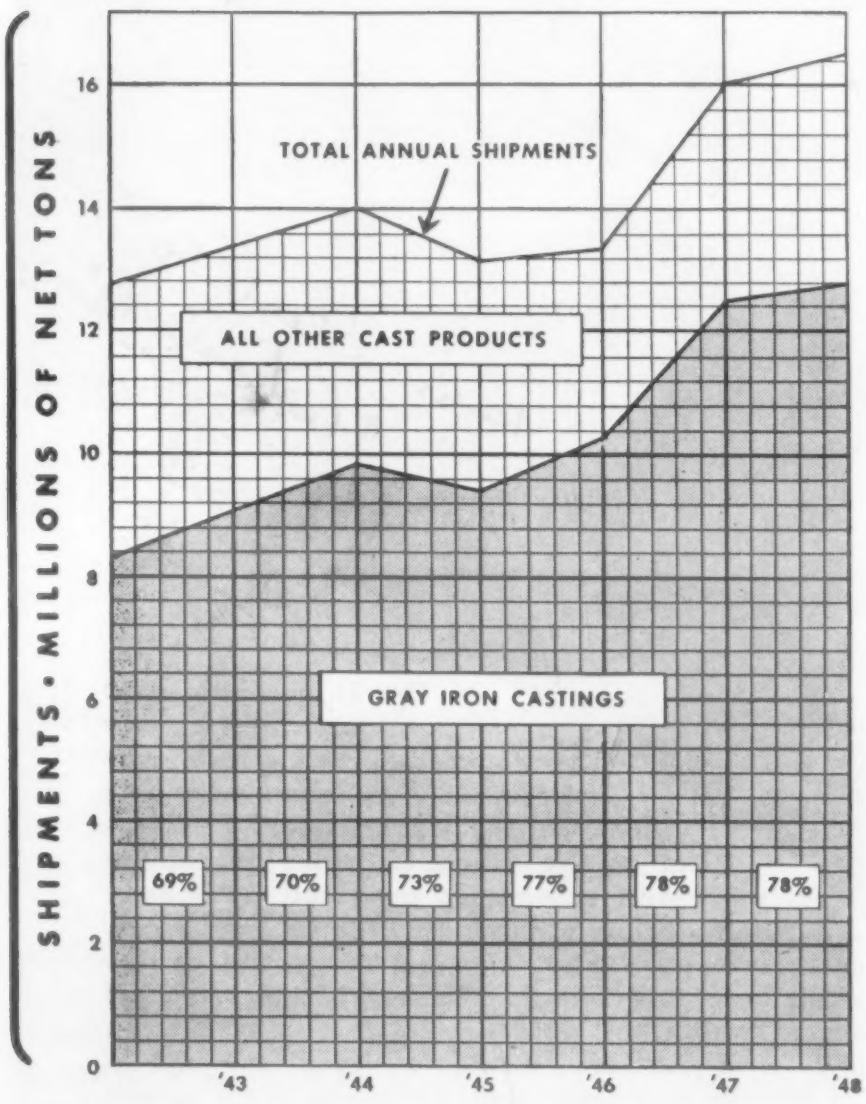


*Chart based on the comparative costs of raw materials (Materials & Methods—Engineering File Facts, Number 156—March, 1948).

Where you need volume *and* weight for stability and rigidity, Gray Iron gives you the greatest economy. You can buy more of it per dollar than any other metal. (See chart above.)*

But ultimate economy is only one of 11 reasons for Gray Iron's increasing popularity. Its other advantageous characteristics include:

- Castability
- Rigidity
- Low Notch Sensitivity
- Wear Resistance
- Heat Resistance
- Corrosion Resistance
- Machinability
- Vibration Absorption
- Durability
- Wide Strength Range

These are the reasons for the steady increase in the use of Gray Iron as against all other cast products. (See chart at left.)

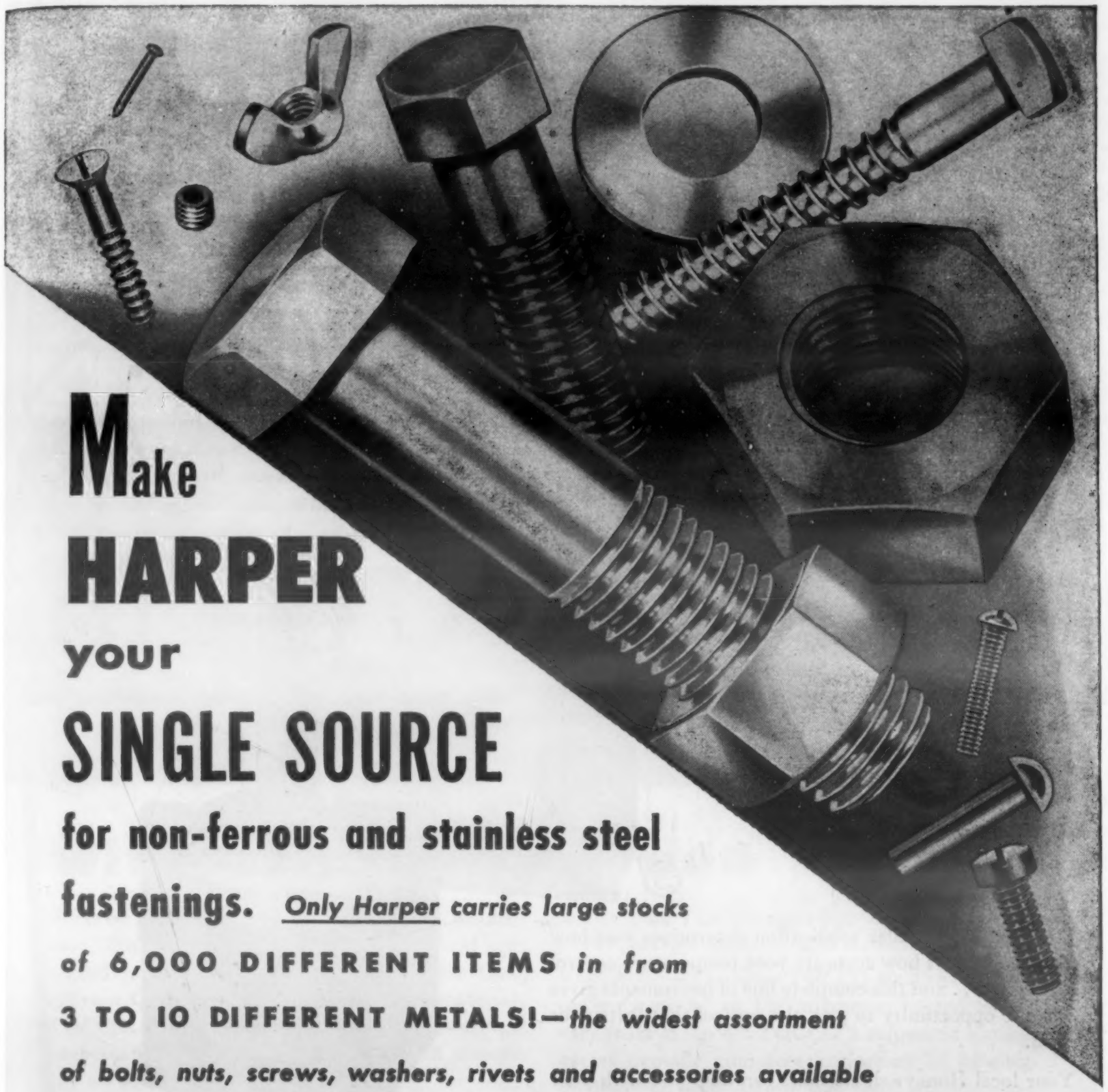
Are you taking full advantage of Gray Iron's unmatched combination of properties in *your* products?

Write for free booklet, "GRAY IRON—Its Mechanical and Engineering Characteristics, and Details for Designing Cast Components".

Make It Better With Gray Iron

Second largest industry in the metal-working field.

GRAY IRON FOUNDERS' SOCIETY, INC.
NATIONAL CITY-E. 6th BLDG., CLEVELAND 14, OHIO



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① *ElectroniK* Circular Scale Indicator-Controller
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④ Pyr-O-Vane Millivoltmeter Controller
⑤ Protect-O-Vane Excess Temperature Cut-Off

Your own particular application determines just how precise and just how accurate your temperature control should be . . . and this complete line of instruments gives you the opportunity to pick the control that suits your need.

Your local Honeywell engineer can help you with your selection . . . and he can be impartial about it because he knows that in this line you can find the instrument that is ideal for your operations! Call him in, today . . . or write for catalog.

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Forging: COPPER • BRONZE • ALUMINUM • MONEL AND STAINLESS STEEL

DIE LIFE
INCREASED
UP TO
400%

Heating for forging 1" stainless hex-head machine bolt blanks with 10,000 cycle TOCCO Induction Heating Unit. Photo — courtesy The H. M. Harper Co.

with TOCCO* Induction Heating

● Naval Bronze, Silicon Bronze, Copper, Aluminum, Monel and all types of stainless steel are heated for forging at the H. M. Harper Co., Morton Grove, Illinois. Regardless of material TOCCO can be profitably applied to brazing, heat-treating and forging operations in almost any metal-working plant.

PRODUCTION UP—In addition to the very important savings in forging dies, TOCCO has increased production to as much as 265% of output possible with former heating methods. On the 1" type 303 Stainless machine bolt blanks shown here TOCCO upped production from 75 to 200 parts per hour, using 35 K.W., 10,000 cycles.

VERSATILE—The same TOCCO machine is used on stock of ⅜" to 1¼" diameter; heated zones vary from ½" to 4". TOCCO'S automatic timing cycles provide complete uniformity of heating throughout both length and cross section—assuring a uniformly high quality product.

●

Why not have a TOCCO Engineer investigate your plant to determine where TOCCO can cut your costs and streamline your production?

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Please send copy of "Typical Results of TOCCO Induction Heating for Forming and Forging".

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Photo by Toby Chadwick

JMLco F131

Profitable New Product Invented by Foundry...

A sound idea, engineering skill, and the *right* Federated metals for its cast components are combined in the LITTCO ELECTRIC MOWER, manufactured by the Littlestown Hardware and Foundry Company, Inc., Littlestown, Pa.

Competent design and liberal use of castings made of Federated aluminum alloys have resulted in the production of a 24 lb. electric lawn mower which, although it requires only one hand to operate, will cut grass up to 15 inches high with no trouble.

Eighteen parts of the mower, including the sides, the housing, wheels, back rollers and brackets, are cast of Federated TENZALOY and Federated F-720, the former being used where extra high strength is demanded.

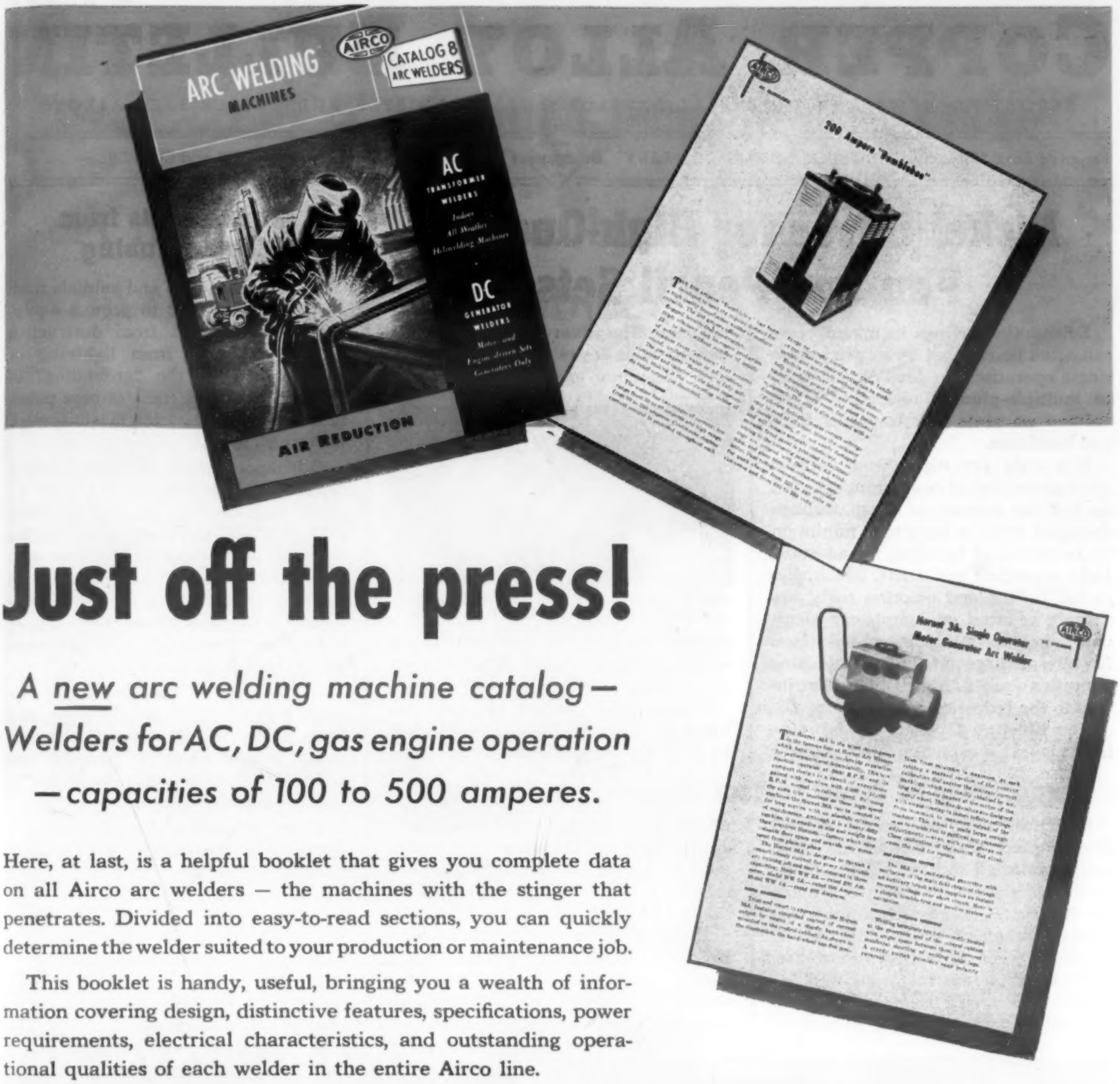
TENZALOY is produced only by Federated Metals. It is an aluminum alloy which gives high strength without heat treatment, as-cast strengths reaching 30,000 psi., and still higher with 10-14 days aging at room temperature.

For TENZALOY . . . for any non-ferrous alloy, including aluminum, magnesium and copper-base foundry metals; solders; bearing metals; and fabricated lead products . . . see Federated first.

Federated first in the non ferrous field FMD

Federated METALS DIVISION

AMERICAN SMELTING AND REFINING COMPANY, 120 BROADWAY, NEW YORK 5, N.Y.



Just off the press!

A new arc welding machine catalog—
Welders for AC, DC, gas engine operation
—capacities of 100 to 500 amperes.

Here, at last, is a helpful booklet that gives you complete data on all Airco arc welders — the machines with the stinger that penetrates. Divided into easy-to-read sections, you can quickly determine the welder suited to your production or maintenance job.

This booklet is handy, useful, bringing you a wealth of information covering design, distinctive features, specifications, power requirements, electrical characteristics, and outstanding operational qualities of each welder in the entire Airco line.

To give you some idea of the amount of material covered by this definitive booklet, here are a few of the many welders covered.

- "Bumblebee" and MCT — Transformer AC Arc Welding Machines
- "Hornet" 36A and "Wasp" — DC Arc Welding Machines
- "Yellow Jacket" Gas-Engine Driven Arc Welders
- Customer-Assembled Gas Engine Sets

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COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

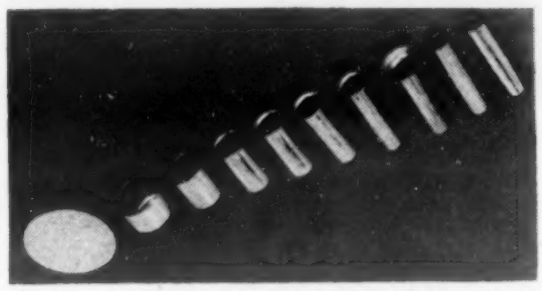
Prepared Each Month by BRIDGEPORT BRASS COMPANY "Bridgeport" *Headquarters for BRASS, BRONZE and COPPER*

Nickel Silver for High-Quality Pen and Pencil Sets

Substantial savings in manufacture can often be realized by a switch from single operations on deep-drawn shells to multiple-plunger machines where volume warrants investment in tools and machines.

Not only are direct and indirect labor costs slashed and output speeded up but the amount of scrap through damaged work is kept to a minimum by reduction of handling. In addition, nicks, scratches and dents, which skyrocket buffing and coloring costs, are sharply reduced or completely eliminated in multiple-plunger machines. No intermediate annealing or cleaning operations are needed which contributes to the reduction in cost.

The illustrated pencil cap is made from nickel silver on a multiple-plunger machine. The silver-white color of the base metal is desirable for silver nickel and chromium plated finishes since



Highly ductile nickel silver is ideal for shells deep-drawn on multiple-plunger machines.

wear of the plate on high spots is not as noticeable as when a different color is revealed.

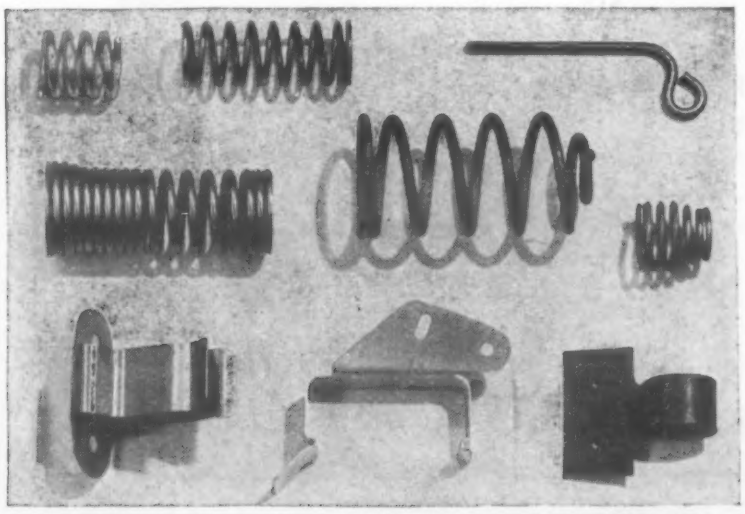
Nickel silver, when properly annealed, is very ductile and lends itself to multiple-plunger operations.

Importance of Using Correct Materials for Springs

Electrical and mechanical control devices place their dependence upon both the design and the quality of the vital spring parts involved, which are infinitesimal in cost as compared to the whole mechanism or product that it protects. It is of the utmost importance, therefore, that the material used for making the spring is correct for the application and stands up in service under good and bad conditions. Since only a very small amount of metal is actually used in each spring, it is pennywise and pound foolish to "economize" in the cost of spring material specified.

Bridgeport improved Phosphor Bronze, when used more generously for spring applications, can do much towards raising the quality of products by increasing their service life. The combination of unusual resilience under repeated flexing stresses, low friction coefficient when used in sliding contacts with other metals and its excellent corrosion resistance make it an ideal spring material.

In the selection of the spring material of the correct composition and temper, Bridgeport's Laboratory can give you valuable assistance.



Spring parts courtesy The Reliable Spring and Wire Forms Co., Cleveland, Ohio.

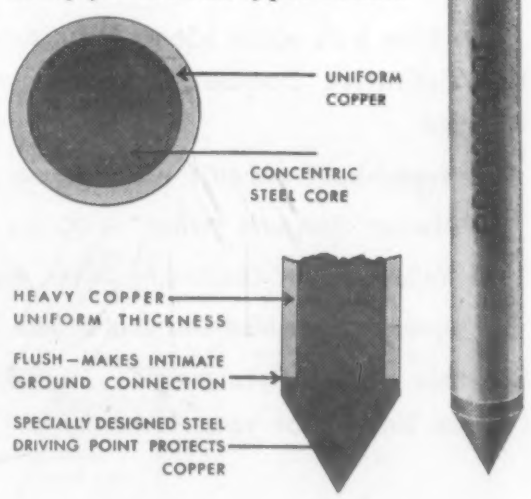
Ground Rods from Copper Tubing

To safeguard men and animals from electrical shock and to protect equipment or apparatus from destructive damage resulting from lightning or electrical faults, the "grounding" of motors, generators, transformers, poles, radio antenna, television masts, towers, tanks, etc., is required.

Bridgeport Brass has been making copper ground rod for the past 17 years. High conductivity copper tubing .032-.035" wall thickness of the smaller sizes and .058" thick on 1" diameter is mechanically bonded to a core of rigid steel for easier driving. A special flush-type driving point protects the copper shell from abrasion and damage when driven into hard stony soils.

In this way an excellent copper-to-earth contact at all points is assured because the smooth streamlined shape makes a hole no larger than the rod itself. The driving end is chamfered to prevent mushrooming.

Since grounding installations are of a permanent nature, adequate resistance to corrosion of the ground rod from the soil and moisture is essential. Because of the heavy wall of corrosion resisting copper, Bridgeport ground rods have a high carrying capacity and are designed to give trouble free service for many years in all types of soil.


UNIFORM COPPER
CONCENTRIC STEEL CORE
HEAVY COPPER UNIFORM THICKNESS
FLUSH—MAKES INTIMATE GROUND CONNECTION
SPECIALLY DESIGNED STEEL DRIVING POINT PROTECTS COPPER

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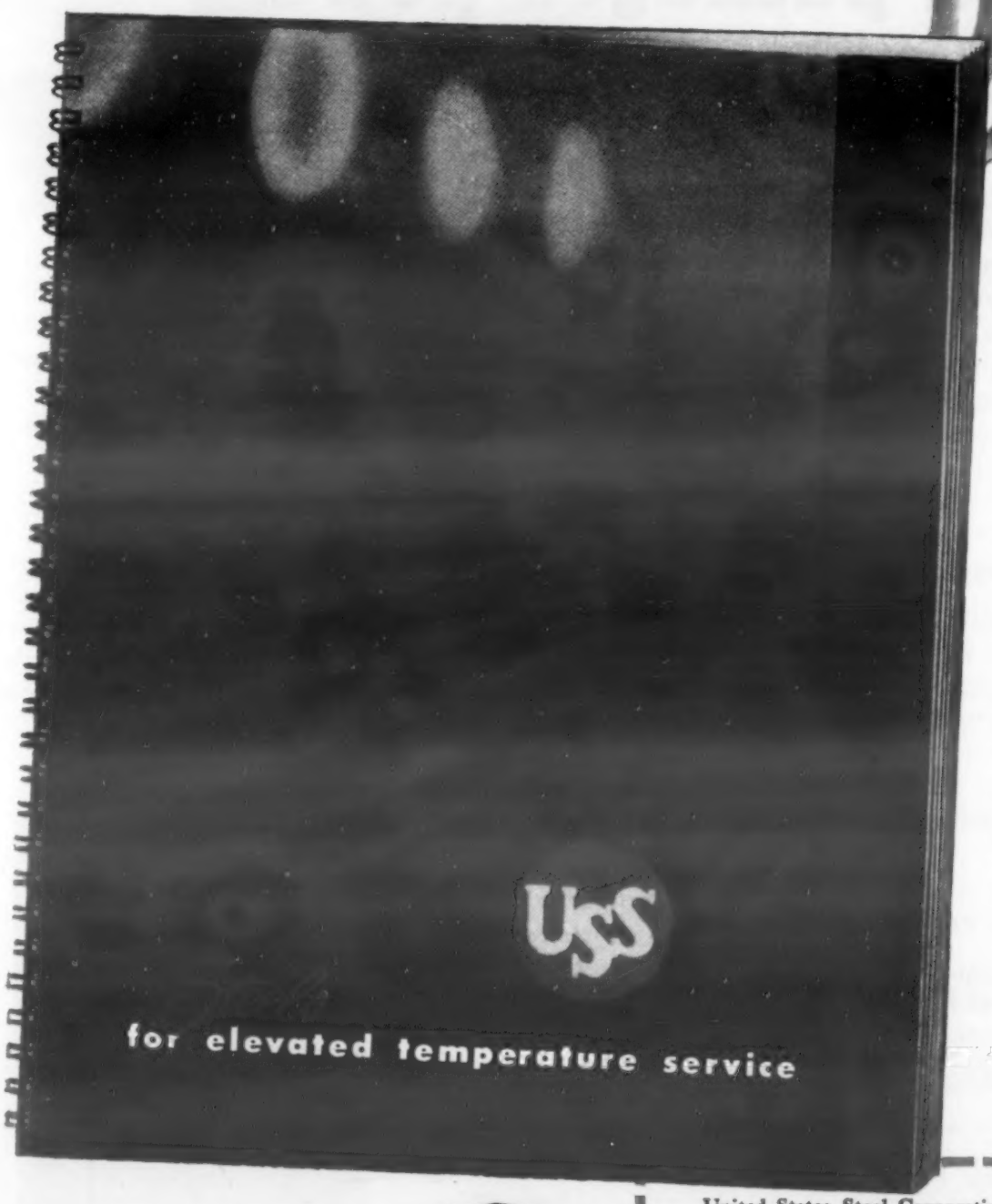
"Steels for elevated temperature service"

A new, authoritative book on this important subject . . . yours for the asking!



JUST PUBLISHED, this book is the result of 15 years' study of high temperature problems by United States Steel Corporation and its manufacturing subsidiaries.

It is designed to be helpful to engineers, metallurgists and chemists in their quest for suitable structural materials that will maintain adequate strength under the elevated temperatures involved in the power, petroleum, transportation, chemical, and other industries having similar problems.

In its pages are discussed the general principles of behavior of ferrous materials under elevated temperatures, the various factors that influence this behavior, as well as the special testing equipment and laboratory technique used to evaluate the elevated temperature properties of steel.

In the comprehensive data section, the significant property values of *twenty-one* different steels, suitable for use at elevated temperatures, are presented both in tabular and graphical form. Characteristics such as high temperature strength, corrosion resistance, weldability and others are discussed.

Much of the information in this book has never before been published. You'll find it invaluable as a reference if your work involves the operation of equipment that must function at elevated temperature. Use the coupon.

Listen to...The Theatre Guild on the Air, *presented every Sunday evening by United States Steel. National Broadcasting Company, coast-to-coast network. Consult your newspaper for time and station.*

United States Steel Corporation Subsidiaries
Room 2119, Carnegie Building, Pittsburgh 30, Pa.

☐ Please send me the new book, "Steels for Elevated Temperature Service."

☐ Please have a representative call on me.

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

PACKAGED CONTROL

where you want it

with G-E packaged power plating rectifiers

General Electric's "on-load" manual plating control provides a simple, convenient and highly dependable means of varying d-c tank voltage. The control contains stop and start buttons—a "coarse" and a "fine" switch which make 36 steps on a 230-volt system and 60 steps with a 440-volt system. Changes can be made step to step "on load"—without current interruptions. In a G-E Packaged Power Unit the manual control is normally located near the tank for the operator's convenience—while the rectifiers are tiered in another room—away from acid fumes.

FLEXIBILITY—WITH "PACKAGED POWER"

"Packaged Power" means decentralized power—with one package to power one tank at the voltage you want without rheostat losses. Each package contains its manual control and one to four rectifiers. To meet changing production needs, rectifiers may be grouped in parallel for heavy current loads or in series for higher voltages. Additional rectifiers can be added or the entire package can be shifted easily, quickly.

HIGH EFFICIENCY—WITH "PACKAGED POWER"

"Packaged Power" rectifiers cut your power costs. Their efficiency is better than 70 per cent from half-load to full load—approximately 60 per cent at quarter-load. Because these rectifiers use slow-aging through their virtually unlimited life.

—AND THERE'S MORE TO "PACKAGED POWER"

Yes, there are other advantages for you with "Packaged Power." There's low initial cost, low amortization cost, full mechanical and electrical protection, and more—including the large 2000-amp with automatic control or manual control, or smaller 300-amp and 50-amp packages. We'd like you to have the whole story. Ask for Bulletin GEA-5247—"General Electric Copper-Oxide Rectifiers and Controls." *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

This is "500" Packaged Power with Manual Control

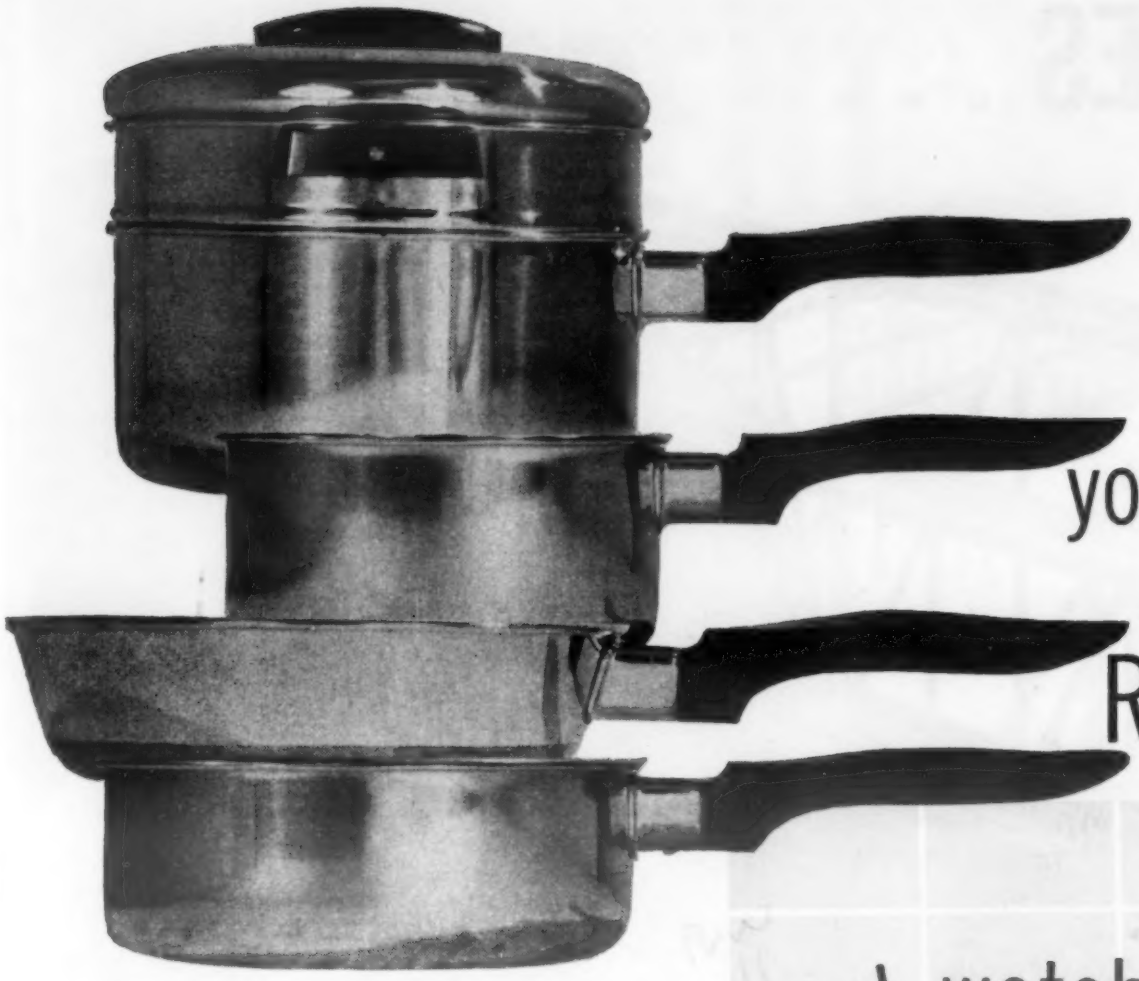
MANUAL CONTROL—Together with "stop" and "start" buttons, volt and ammeter, this control has a "coarse" and a "fine" switch which make 36 steps on a 230-volt system and 60 steps on a 440-volt system. Changes can be made "on load", without current interruptions. One manual control handles one to four rectifiers.

"500" RECTIFIER — Complete within itself, this rectifier contains long-lived over-sized copper-oxide rectifier stacks. It is fully protected from electrical and mechanical failures. Fan provides even flow of air around the stacks and transformers. Removable front panel provides easy access to all parts.

Wide Current Selection with "Packaged Power"

"500" Packaged Power units in multiples of 3 kw are available for outputs of 1 to 24 volts and 125 to 2000 amps. Virtually any practical combination of voltage-current ratings are available within these wide limits.

GENERAL ELECTRIC



Ekcoware "Starter Set" and double boiler with lustrous, durable Resinox handles . . . molded by Chicago Die Mold Mfg. Co., 4001 W. Rightwood Ave., Chicago, Ill. for Ekco Products Co., 1949 North Cicero Ave., Chicago 39, Ill.

Handle your product with RESINOX 10231 and watch sales climb!

Are you looking for a new, sure-fire selling feature these days for your pots, pans, or appliances? Then grab hold of the new handles molded from Resinox 10231!

Monsanto developed this new phenolic especially for handles, knobs, housings, bases, etc. It *adds four sales pluses* to your product:

1. ***New higher heat resistance.*** **Tests prove Resinox 10231 will withstand 500° F. exposure for 240 hours. Will not blister when transferred directly from room temperature to hot oven.**
2. ***Deeper, richer black tone . . . with best gloss and surface finish ever offered.***
3. ***Durable*** **. . . excellent chemical and moisture resistance, formulated to resist dulling and greying, washing and wear.**
4. ***Applicable to new designs.*** **Resinox 10231 has proved less critical to mold, adapts readily to new ideas.**

From the manufacturer's standpoint, handles of Resinox 10231 have two more important features: faster cure cycle and "one-shot" production . . . with finishing, machining, all done at once.

Molders, manufacturers, designers . . . it will pay you to investigate Resinox 10231 now. Use the coupon to get full information.

Resinox: Reg. U. S. Pat. Off.

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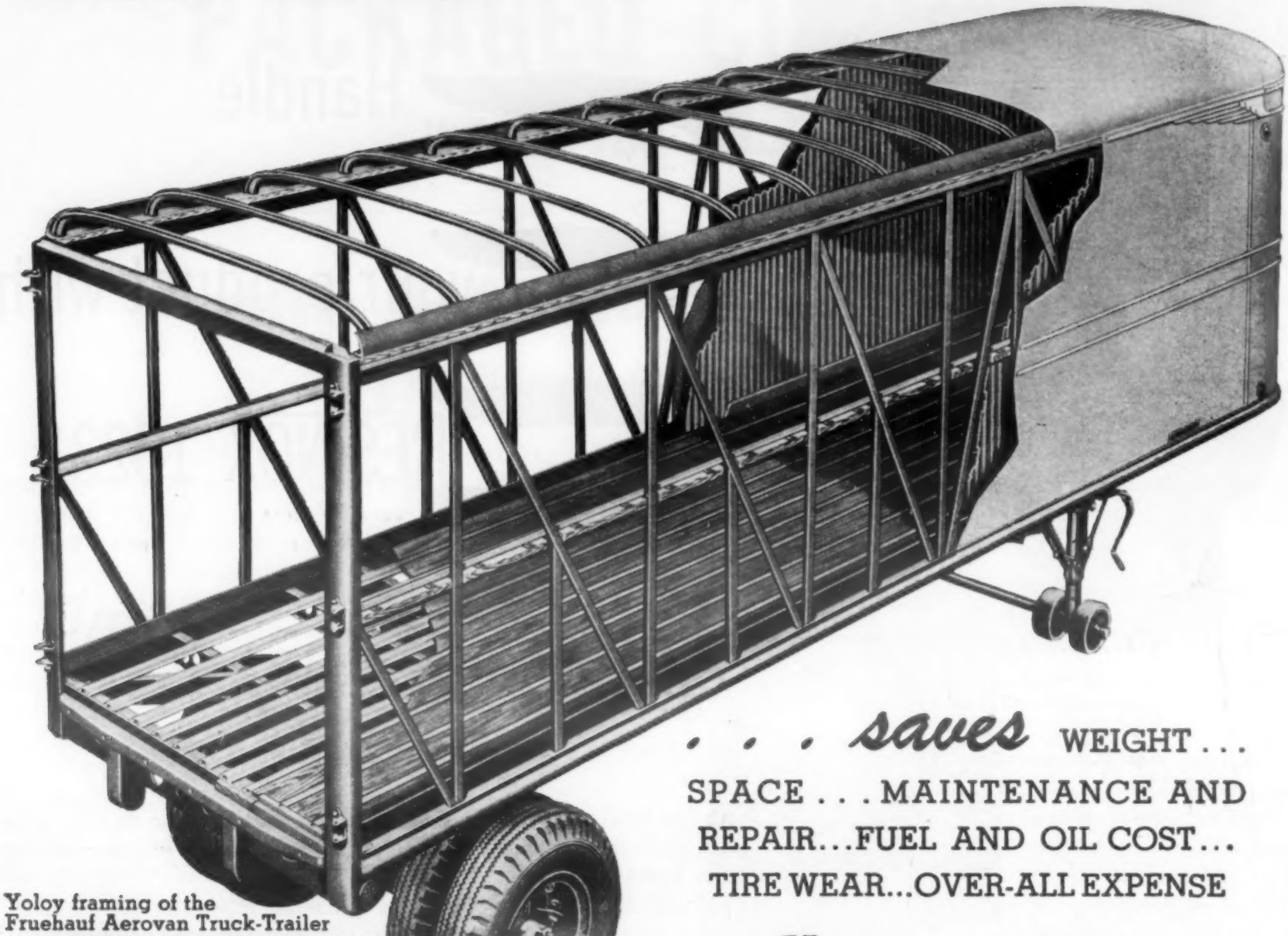
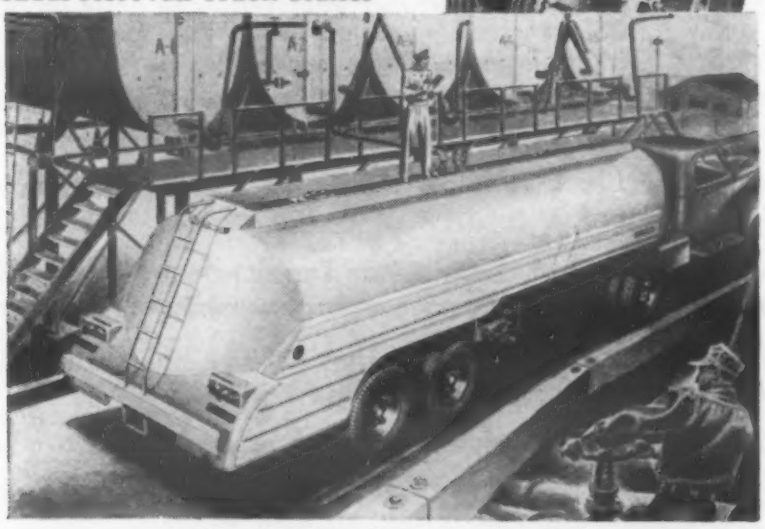
YOLOY SAVES . . .



Yoloy framing of the
Fruehauf Aerovan Truck-Trailer



Fruehauf Tank-Trailer has Yoloy Steel tank

. . . *saves* WEIGHT . . .
SPACE . . . MAINTENANCE AND
REPAIR . . . FUEL AND OIL COST . . .
TIRE WEAR . . . OVER-ALL EXPENSE

USERS of Fruehauf Truck-Trailers enjoy the many advantages of lighter weight body construction made possible through the use of Yoloy high-strength steel.

Structural members of Yoloy are light in weight, yet have the strength of conventional steels much heavier and thicker. Yoloy reduces vehicular dead weight and permits extra payload. Being a nickel-copper steel of outstanding toughness, Yoloy is also highly corrosion resistant, shock resistant and durable. Yoloy is available in sheets, plates, strip, bars and tubular products.

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YOLOY STEEL

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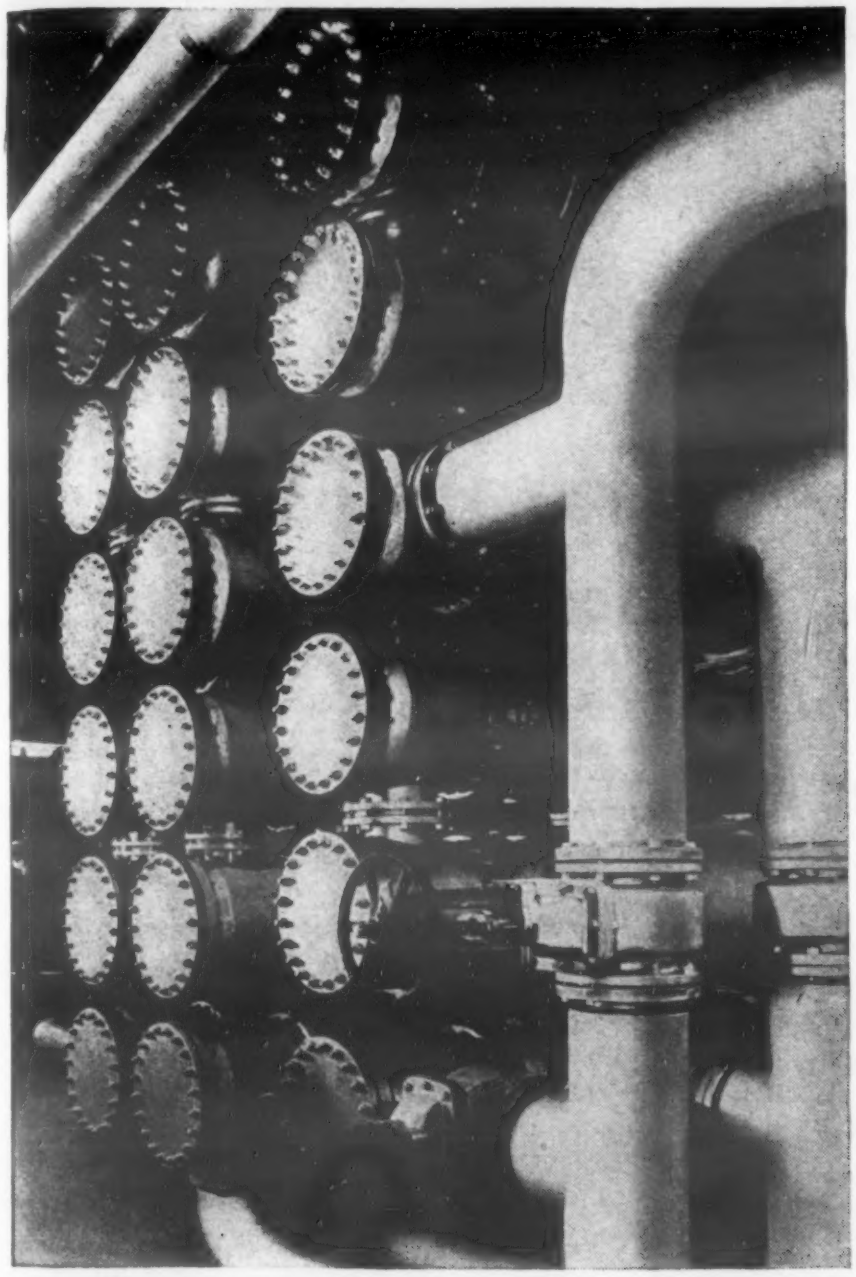
TRENT

tubing chosen for world's largest sulfite liquor alcohol plant



Stainless steel heat exchangers for cooling waste sulfite liquor to fermentation temperatures in the alcohol process.

Using waste sulfite liquor from the adjacent Gatineau Mills of the Canadian International Paper Company, the new $3 million plant of Commercial Alcohols, Ltd., of Montreal, has commenced production with a capacity of 9,000 U. S. gallons of alcohol per day.

Design, engineering and construction were carried out by Vickers-Vulcan Process Engineering Company, Ltd., a joint subsidiary of The Vulcan Copper and Supply Company and Canadian Vickers, Ltd.

The extensive use of stainless steel throughout the processing is a significant endorsement of the reputation stainless steel has established in the pulp and paper and the chemical industries. To this reputation TRENT has made important contributions, particularly by demonstrating the advantages of *precision-finished* tubing—machine-formed, machine-welded and machine-sized for uniformity from 1/8" to 30" inclusive.

It is noteworthy, therefore, that TRENT tubing was chosen for all services requiring stainless steel piping and tubing, including sulfite liquor lines, heat exchangers, and other stainless steel process piping in the world's largest sulfite liquor alcohol plant. Perhaps *you* have an application that can best be solved by TRENT tubing. We will be glad to give any desired assistance. Informative data on request.

TRENT TUBE COMPANY
Subsidiary of Crucible Steel Company of America
General Office and Plant—East Troy, Wisconsin
Sales Offices: Chicago: 4501 W. Cortland St.
New York: Chrysler Building

TRENT STAINLESS STEEL TUBING

TOOLING UP? You save three ways when you harden the Vapocarb-Hump way

IN tooling up for new products . . . or retooling for present models . . . there's often opportunity to make significant savings, simply by improving the heat-treatment of necessary punches, dies, and other tools. For the heat-treatment—the strength-giving process in tooling-up—largely determines the value of all tool designing and machining which have gone before.

A tool like the one above, for example, is worth at least $150 when it reaches the heat-treat, for at that point it represents a hundred pounds of high-grade steel plus several days of painstaking effort and irreplaceable labor. It's up to the heat-treater to help meet production timetables and assure that this previous investment results in a tool which will give maximum service.

With a Vapocarb-Hump furnace for hardening . . . and a Homo furnace for tempering . . . a competent heat-treater will give you the full results to which his skill and experience entitle you. He'll make any tool—whether a massive die, an insert, or a tiny slitting edge—perform to maximum ability. He'll make your heat-treat a steady source of triple savings . . . savings which reach back into the toolroom—and forward into production departments.

1. Little or no refinishing . . . because tool surface is protected by Vapocarb atmosphere control.

2. No rejections . . . because tool shape and size are "as expected" under rate of heating control.

3. Long tool life . . . because correct internal structure can be produced through Hump control of quench point.

• • •

Ask an L&N engineer to explain the Vapocarb-Hump —and Homo Methods. Or, if you prefer, we'll send our catalog. Leeds & Northrup Co., 4925 Stenton Ave., Philadelphia 44, Pa.

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Need Stainless Steel?

CALL US!

It's always wise to "Call Us" when you need stainless steel. For it's a fact that *U·S·S* Stainless Steel is "tops" in quality, dependability and proven excellence.

Right now our stocks include No. 2B Finish Sheets and No. 4 Finish Sheets of uniform quality. Also bars, meeting high standards of machinability; plates up to 120″ wide and 360″ long . . . as well as welded and seamless tubing, pipe, angles, channels, welding electrodes in all standard grades and specifications are on hand for your needs.

So call our nearest warehouse or sales office. You'll get prompt, courteous service. Meanwhile, why not fill in and return the convenient coupon for our free booklets on U·S·S Stainless Steel? Do it now.

UNITED STATES STEEL SUPPLY COMPANY
USS STEELS
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Without obligation on our part, please send us FREE booklets on U·S·S Stainless Steel as checked below:

☐ Introduction to Stainless Steel
☐ Fabrication of Stainless Steel

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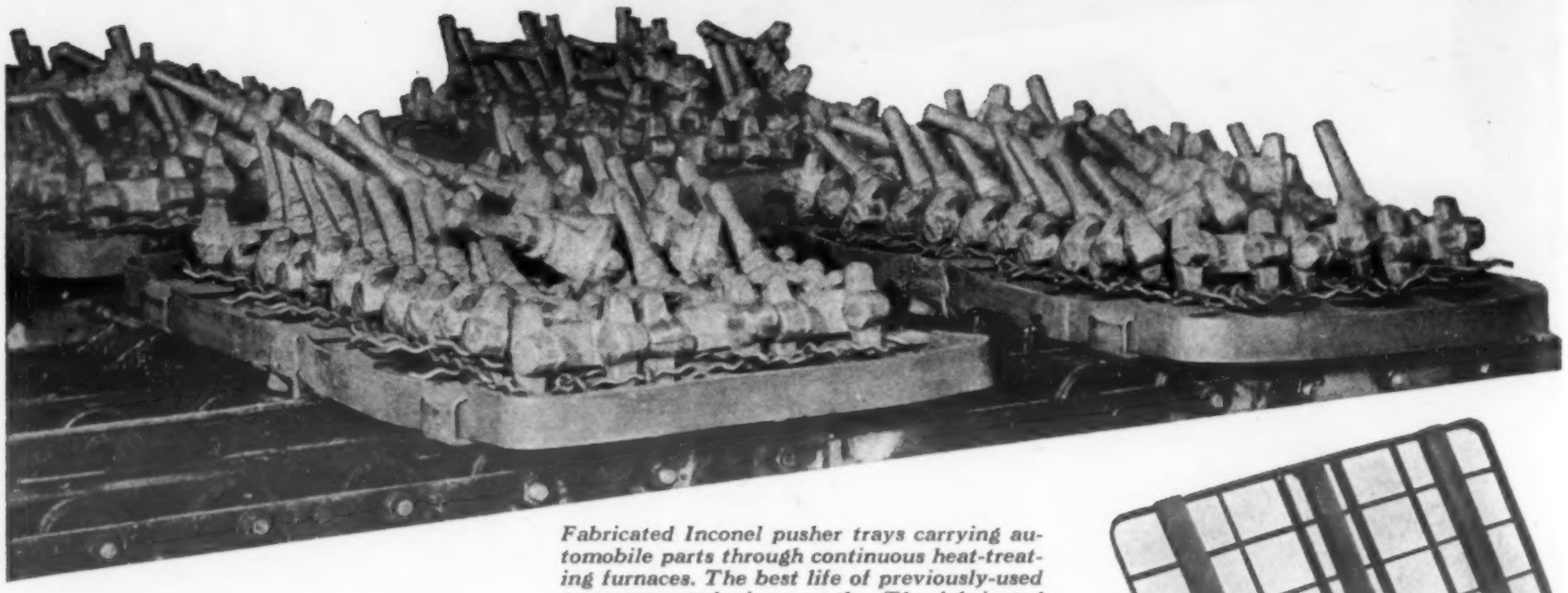
USS

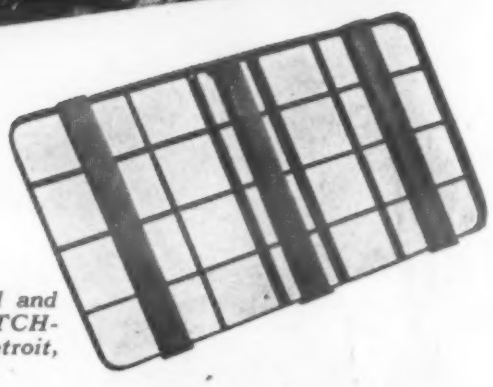
UNITED STATES STEEL

Meet a *LIGHT-WEIGHT* champion..

Inconel pusher trays still going strong on a job that licked heavier furnace trays!



Fabricated Inconel pusher trays carrying automobile parts through continuous heat-treating furnaces. The best life of previously-used trays averaged nine months. The fabricated Inconel trays have been in use over one year.



Inconel pusher tray designed and fabricated by BROWN-HUTCHINSON IRON WORKS, Detroit, Michigan.

- **Furnace production increased**
- **Tray life increased**
- **Maintenance costs reduced**

These substantial benefits are what a large automobile manufacturer gained by switching to fabricated Inconel* pusher furnace trays.

Previously-used trays weighed from 114 to 198 pounds each. The fabricated Inconel trays weigh only 86 pounds... a weight saving 28 to 112 lbs. per tray. Based on average net load of 400 pounds this represents a gross weight saving of 5 to 19% over previous equipment.

Even more important—these lighter-weight fabricated Inconel trays last longer, with correspondingly reduced replacement and maintenance costs.

This fine performance record is even more remarkable when the severity of service conditions are considered. During the heat-treating of automobile parts, the trays are subjected to temperatures as high as 1650° F., followed by oil quenching.

The furnaces, which are gas-fired and non-atmosphere in type, present high-temperature corrosion problems. Add to these punishing conditions the considerable mechanical forces acting on the trays... up to 540 pounds load plus 2000 pounds thrust from the hydraulic pusher mechanism... *and you have service conditions that demand Inconel plus good fixture design.*

Brown-Hutchinson Iron Works are designers and fabricators of these pusher trays. They, like other leading fabricators, specify Inconel because of Inconel's outstanding performance record and desirable combination of physical characteristics... thermal durability, corrosion-resistance, high hot and cold strength, workability, economy.

For further information about pusher trays made of Inconel, write directly to: Brown-Hutchinson Iron Works, 1831 Clay at G. T. R. R., Detroit, Mich. *Reg. U. S. Pat. Off.

EMBLEM OF SERVICE INCO

The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

INCONEL*...for long life at high temperatures

BAKELITE NEWS NO. 8

NOTES FROM BAKELITE CORPORATION ON BETTER, FASTER, LOWER COST PRODUCTION WITH "BAKELITE" PLASTICS

BAKELITE Phenolics Make WARM FRIENDS!

❶ Looking for a strong, lightweight, heat-resistant material? Your warm-friend-in-need may well be a BAKELITE Phenolic Plastic—as it is for this "Kodaslide" Projector, from Eastman Kodak. Its lens mount, barrel, top, and bottom, are rapidly and inexpensively molded with a smooth, lustrous finish that requires a minimum of finishing. All parts are assembled quickly. A plus value is its excellent electrical resistance. Do these good-looking projectors suggest the use of BAKELITE Phenolics in the parts or products you manufacture?

Molders: Auburn Button Works, Inc., and Waterbury Button & Mfg. Co.

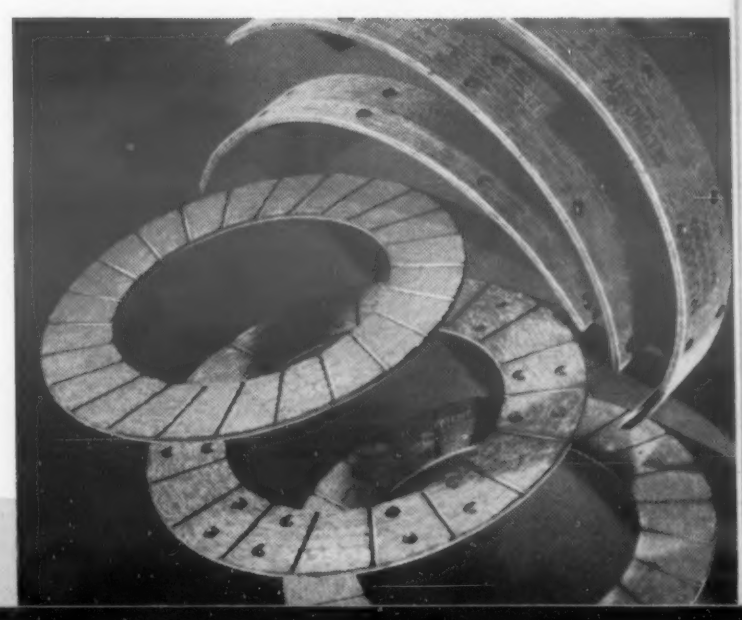
SALES Compelling Premiums Need Premium Quality Plastics

❷ That's why BAKELITE Styrene Plastics are used in the rear-view mirror glare shields included as premium offers with S. C. Johnson & Son's famous "Carnu" auto polish. BAKELITE Styrene Plastics come in virtually every color, transparent, translucent or opaque. They mold easily to close tolerances and fine detail—providing smooth, lustrous surfaces. They are ideal for toys, games, packages, novelties, premiums, brushes, combs, a thousand and one things.

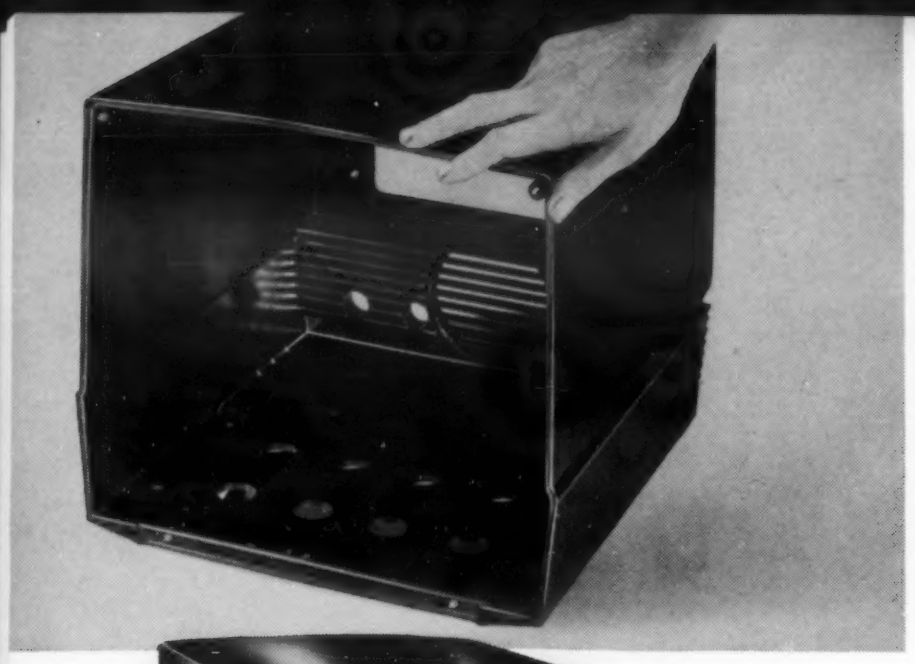
Molder: Armstrong Products Co.

BAKELITE Bonding Resins Help Nearly EVERY INDUSTRY!

❸ Take these "Rusco" brake linings bonded with BAKELITE Phenolic Resins by the Russell Manufacturing Co. Longer service life is demonstrated, for example, on New York City taxicabs where they last nearly three times longer than linings formerly used. Clutch facings last longer, too. It's typical of the way the great variety of BAKELITE Bonding Resins are adding life and efficiency to many products such as abrasive wheels and sandpapers, and glass, mineral and vegetable fiber thermal insulation, storage battery plate separator retainer mats, and tuft binders for carpets and rugs. As sand core bonds for ferrous and non-ferrous metal castings, they're speeding foundry operations, lowering costs.



MORE BAKELITE NEWS ON NEXT PAGE



Bakelite

TRADE-MARK

PLASTICS

BAKELITE CORPORATION

BAKELITE CORPORATION
Unit of Union Carbide and Carbon Corporation UCC
30 East 42nd Street, New York 17, N.Y.

Design Changes Are Easy with Versatile, Adaptable Plastics!

Check coupon below for information on specific subjects illustrated. For general information, write for copy of Booklet G-8, "A Simplified Guide to BAKELITE and VINYLITE Plastics."

BAKELITE CORPORATION, Dept. C-17
30 East 42nd Street, New York 17, N. Y.

Please send information on subjects checked below:

- ☐ 1. BAKELITE Phenolic Plastics
- ☐ 2. BAKELITE Styrene Plastics
- ☐ 3. BAKELITE Bonding Resins
- ☐ 4. BAKELITE Phenolic Plastic Cabinets
- ☐ 5. Plastic-Surfaced Plywood

Name.....*Title*.....

Company.....

Street.....

City.....*Zone*.....*State*.....

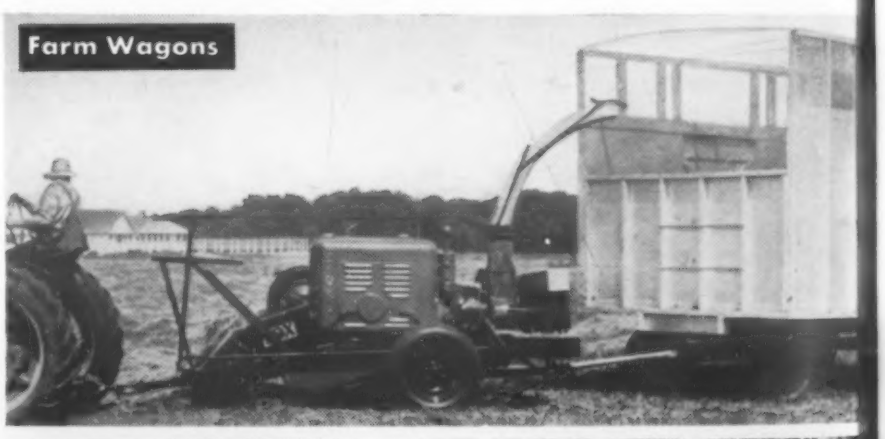
A BETTER TV Cabinet at LOWER COST

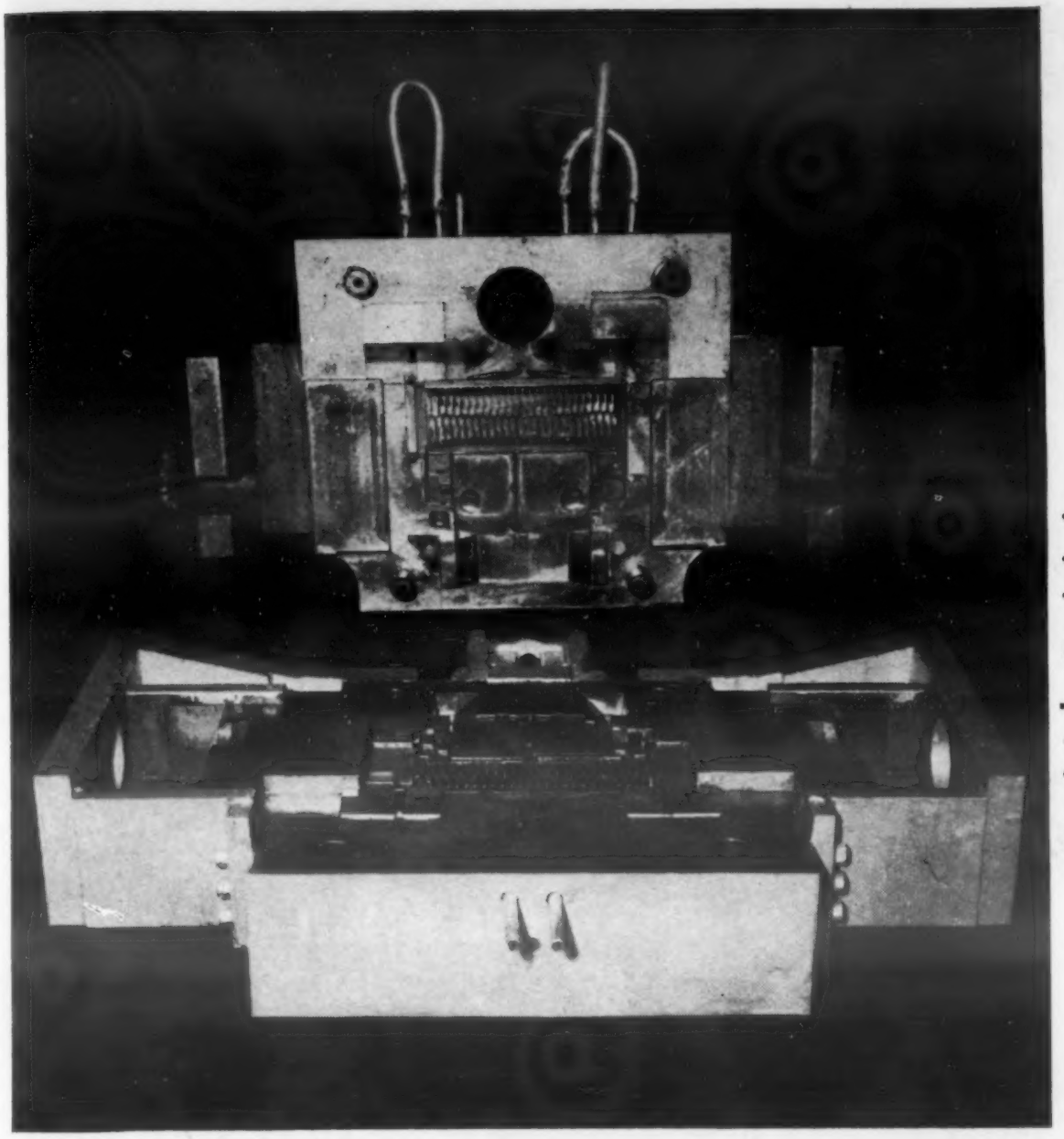
❹ Philco Corporation accomplished just that—with BAKELITE Plastics. Easily and inexpensively molded, the BAKELITE Phenolic cabinets of Philco's new 7 and 10 inch direct-view table-type TV sets permit fast mass production at lowest cost. The cabinets are molded in one piece with all lugs, chassis mountings, and openings completed at the same time. Color and permanent lustrous finish are self-contained. The lower cost helps bring television to more people which means broader markets for Philco.

Molders: General Industries Co., and American Insulator Corp.

Immense New ADVANTAGES in Plastic-Surfaced PLYWOOD!

❺ Paper-plastic surfacing offers these qualities to plywood: Armor-clad resistance to wear and weathering, higher tensile and flexural strengths, greatly decreased moisture absorption, and a better surface for painting. Kimberly-Clark Corp. impregnates a special paper stock with water-soluble BAKELITE Phenolic Resins. Sheets of this "Kimpreg" material are then laid up with the glue-spread assembly of wood plies. The lay up is cured in a hot press. The paper-plastic surfacing is anchored permanently to the plywood. The resultant product is sold by Georgia-Pacific Plywood and Lumber Co. as GPX Plastic Plywood. It is widely used for concrete forms that can be re-used many times; shipping cases, farm buildings and wagons, production-line chutes and tables, marine decking, linings for freight cars and trucks, and sidings for buildings.





And it doesn't have to be **TYPEWRITERS** you're die casting!

Accuracy calls for POTOMAC M

HOT-WORK DIE STEEL

"HOT-WORK STEELS"

is the title of a new, six-page folder that tells about the chromium, molybdenum, vanadium Hot Die Steel known as POTOMAC M—and also covers other grades for other hot-work operations. Secure your copy —*write today!*

ADDRESS DEPT. MM-82

In the precision casting of aluminum, POTOMAC M Hot-Work Die Steel is especially favored as the material for die-casting dies because its properties help assure accuracy of the steel itself *after* heat treatment. Die makers have found that size changes are held to a minimum.

Dimensional stability is thus the *first* contribution that POTOMAC M makes to accuracy.

Production accuracy of the die after it is in service is maintained also by the resistance of POTOMAC M to wear, to heat checking, and to metal wash.

Allegheny Ludlum makes a complete line of steels for hot-work tooling of various kinds—so, whether your need is the mass producing of duplicate parts or fabricating a few of them, call up "A-L" every time for hot-work counsel or service or both. Tell us your requirements.

ALLEGHENY LUDLUM
STEEL CORPORATION
Pittsburgh, Pa.

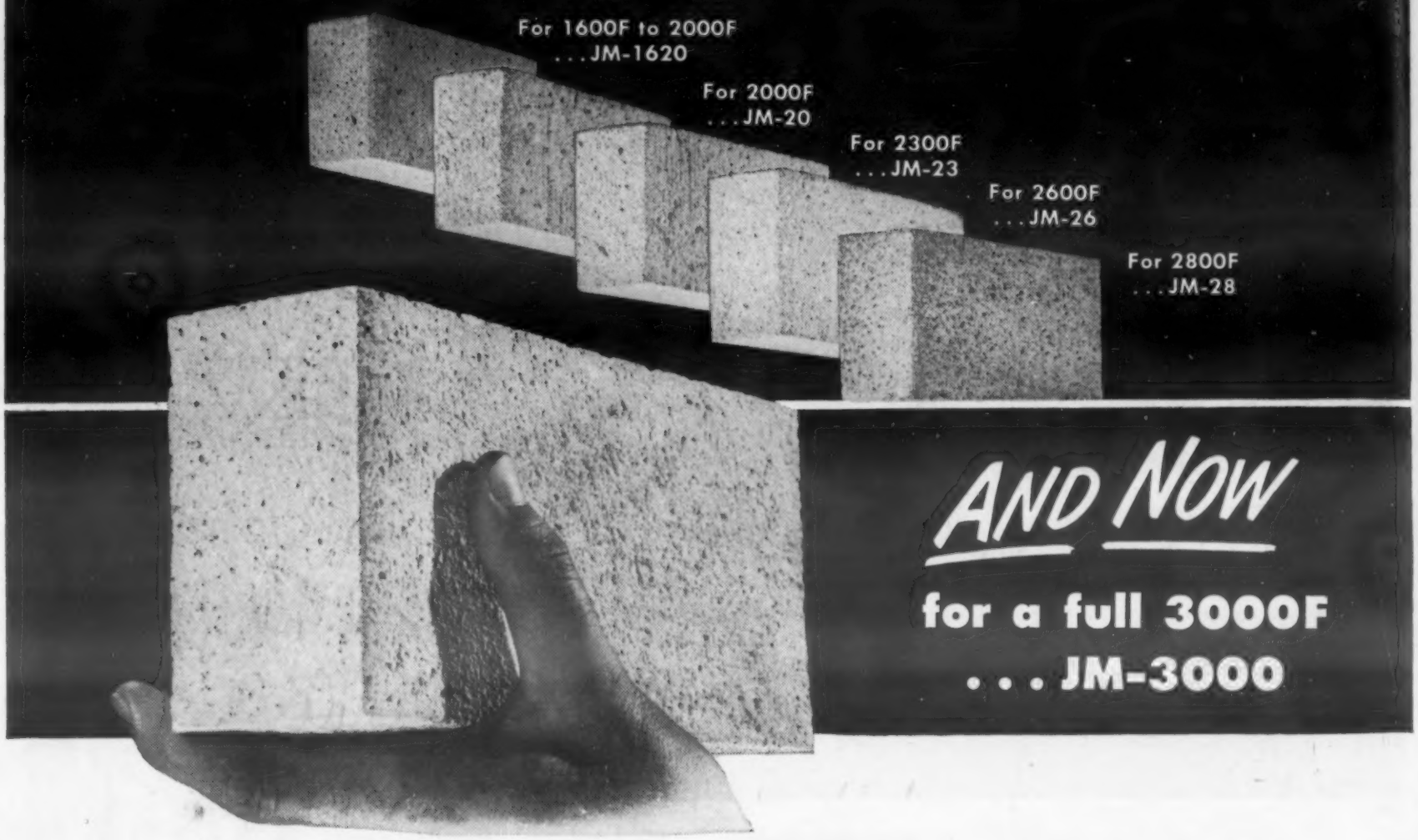
TOOL STEEL DIVISION: DUNKIRK, N. Y.

Fine Tool Steels Since 1854

AL

W&D 2484

MEET the family of Johns-Manville Insulating Fire Brick . .



AND NOW

for a full 3000F
. . . JM-3000

HERE IS AN OUTSTANDING FAMILY of insulating fire brick for back-up or exposed use . . . the only family of its kind . . . that gives you a complete range . . . a *quick heating* insulating fire brick for every purpose.

By taking advantage of the quick heating characteristics of these insulating fire brick, you'll benefit through important savings in fuel because of the quicker rise to proper operating temperature in the furnace. This is a result of the low heat storage capacity and low thermal conductivity characteristics of the brick. These factors are especially important where furnaces are being intermittently operated.

The same materials can also be obtained in large size units as Johns-Manville Insulating Fireblok. This product has many advantages over the smaller size fire brick, from both a construction and stability standpoint. They can be quickly applied because they are easy to cut and fit. J-M Insulating Fireblok provide additional heat savings because they reduce the number of joints, and require less mortar for bonding.

Why not have a Johns-Manville insulation expert call to tell you more about ways in which you can save by using these insulations in your furnaces. Write Johns-Manville, Box 290, New York 16, N. Y. for further information.

	JM-1620	JM-20	JM-23	JM-26	JM-28	JM-3000
Densities, lb per cu ft	29	35	42	48	58	63-67
Transverse Strengths, psi	60	80	120	125	120	200
Cold Crushing Strengths, psi	70	115	170	190	150	400
Linear Shrinkage,† percent	0.0 at 2000 F	0.0 at 2000 F	0.3 at 2300 F	1.0 at 2600 F	4.0 at 2800 F	0.8 at 3000 F
Reversible Thermal Expansion, percent	0.5—0.6 at 2000 F	0.5—0.6 at 2000 F	0.5—0.6 at 2000 F	0.5—0.6 at 2000 F	0.5—0.6 at 2000 F	0.5—0.6 at 2000 F
Conductivity* at Mean Temperatures						
500 F	0.77	0.97	1.51	1.92	2.00	3.10
1000 F	1.02	1.22	1.91	2.22	2.50	3.20
1500 F	1.27	1.47	2.31	2.52	3.00	3.35
2000 F	—	1.72	2.70	2.82	3.50	3.60
Recommended Service						
Back up	2000 F	2000 F	2300 F	2600 F	2800 F	3000 F
Exposed	1600 F	2000 F	2300 F	2600 F	2800 F	3000 F

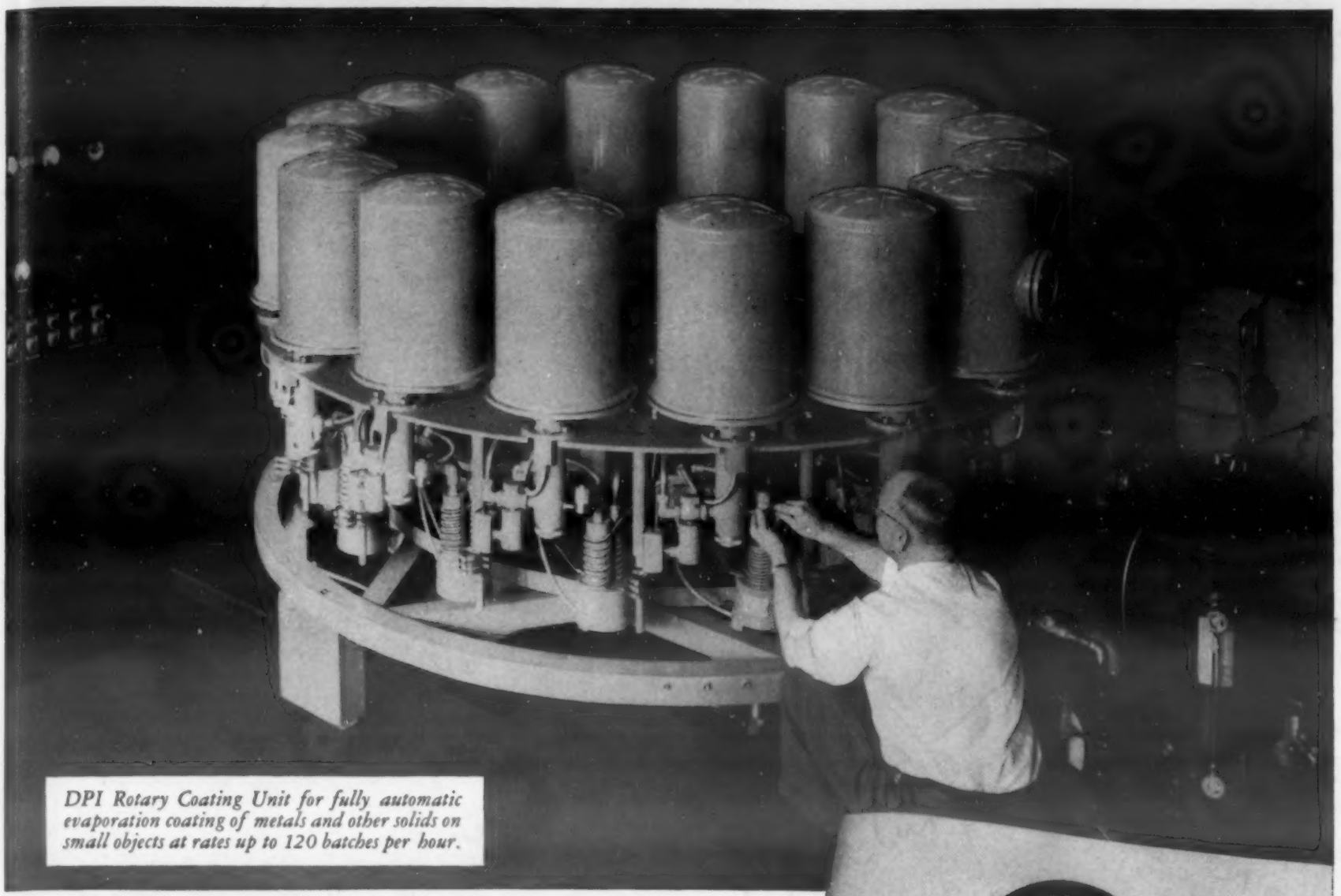
† *24-hr simulative service panel test for JM-3000; 24-hr soaking period for other brick.*

* *Conductivity is expressed in Btu in. per sq ft per F per hour at the designated mean temperatures.*

Note: Above tests are in accordance with A.S.T.M. tentative standards.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville First in INSULATIONS



DPI Rotary Coating Unit for fully automatic evaporation coating of metals and other solids on small objects at rates up to 120 batches per hour.

TO BRING YOU UP-TO-DATE ON HIGH VACUUM COATING

Vacuum coating, well established in many fields, is finding new revolutionary applications in a wide range of industries. There are many new places where it can advantageously supplant chemical and electrolytic methods, brush or spray gun.

The vacuum chambers described in this new booklet also have many uses apart from vacuum coating techniques. They are being used for high altitude studies, for electronics, heat treating, powder metallurgy, impregnation of metals, plastics, and textiles. The smaller coater units can also serve the research laboratory for experiments involving high vacuum phenomena.

VACUUM EQUIPMENT DIVISION

DISTILLATION PRODUCTS, INC.

Subsidiary of Eastman Kodak Company

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Please send booklet "Vaporized Metal Coating by High Vacuum."

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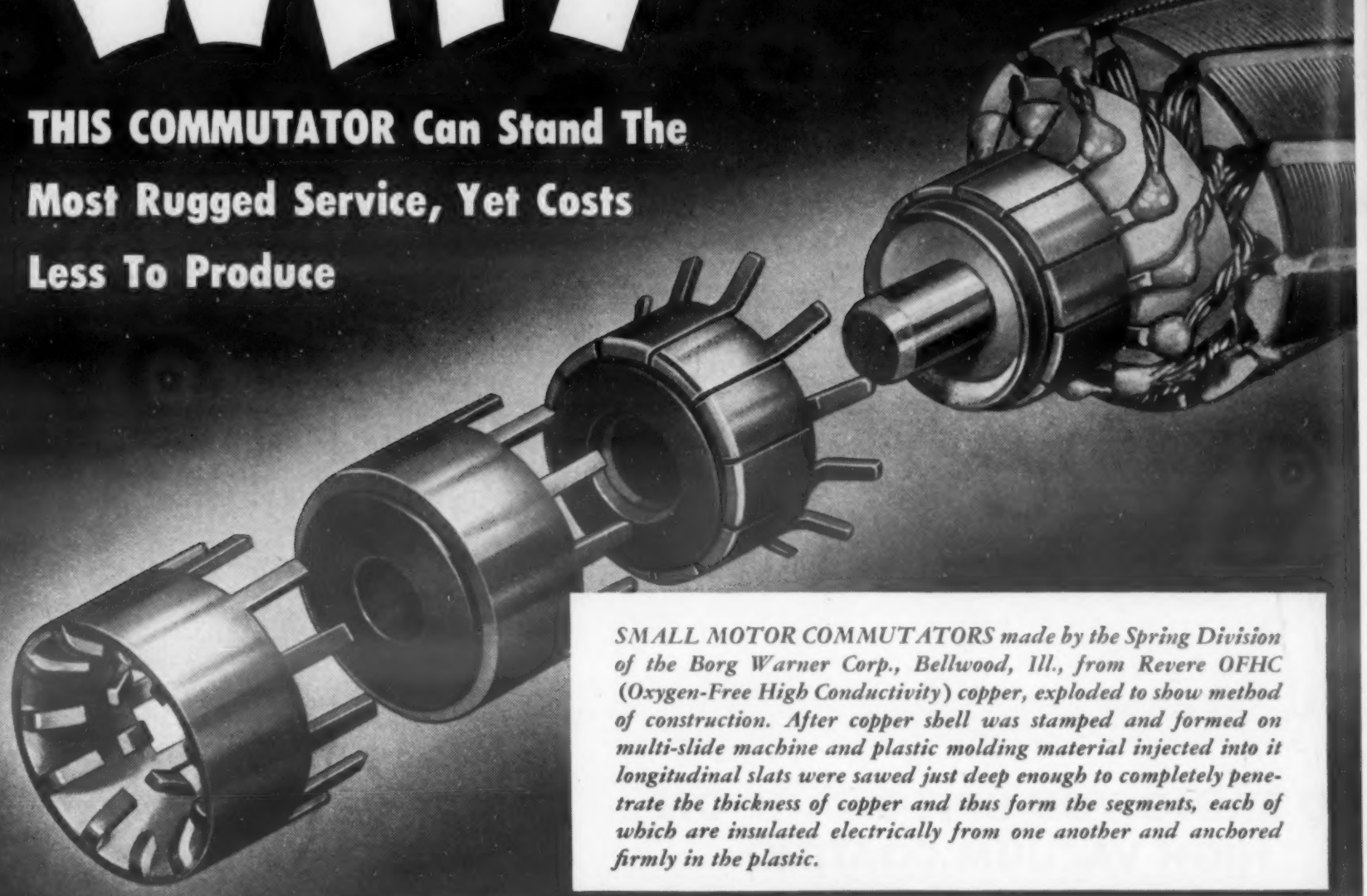
WHY

THIS COMMUTATOR Can Stand The Most Rugged Service, Yet Costs Less To Produce



SMALL MOTOR COMMUTATORS made by the Spring Division of the Borg Warner Corp., Bellwood, Ill., from Revere OFHC (Oxygen-Free High Conductivity) copper, exploded to show method of construction. After copper shell was stamped and formed on multi-slide machine and plastic molding material injected into it longitudinal slats were sawed just deep enough to completely penetrate the thickness of copper and thus form the segments, each of which are insulated electrically from one another and anchored firmly in the plastic.

IT was quite a complex problem the Spring Division of Borg Warner Corp. dropped into the lap of Revere's Technical Advisory Service. They were getting set to manufacture commutators for small motors and they wanted to select the best material for the job.

Here were the specifications: The material had to be the hardest possible yet still able to take the extremely severe forming operation which was to be done in a multi-slide machine. High hardness was necessary in order to combine maximum wear resistance with the ability to withstand the extreme centrifugal force developed in small motors operating at high speeds. In addition, in the molding operation, which is done after the copper shells have been formed, it was necessary to hold the diameter of the shell to within .001″ in order to prevent the plastic from flowing between the mold and the outer surfaces of the commutator. An equal tolerance was also imposed upon the height of the solid cylindrical portion for the same reason. Also of great importance was the need for the cylinder wall being almost absolutely flat.

Because of long experience with somewhat similar problems Revere recommended trial of OFHC (Oxygen-Free High Conductivity) copper, four numbers hard. This was tested along with several other metals. The OFHC alone was found to produce excellent parts, and with tolerances so close as to be almost unbelievable in this type of operation. All other types of copper failed at the very sharp bend where the anchoring lugs join the side of the shell.

An unusual feature of these commutators is the plastic material used in the core. Tough, and unusual in composition, it serves both as insulation and as a mechanical connection between commutator and shaft without use of a bushing and key.

To determine if these commutators could *really* take it, test motors in which they were used were speeded up to 35,000 rpm. Although the wiring in the rotors practically expioded at that speed, there were no failures in the commutators, Temperature tests up to 400° F. were also made. Here again there was no damage to the commutator, though the rotor wiring was badly damaged due to the combination of centrifugal force and decrease in wire strength. Once again the unusual combination of properties of Revere OFHC copper had played a part in helping another one of the country's leading manufacturers produce an outstanding product at less cost.

Perhaps this or some other Revere Metal can be of help in improving your product—cutting your production costs. Toward that end we suggest that you get in touch with your nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

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Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

ake either operation easier with

WEIRTON

HIGH-CARBON STRIP
COLD-ROLLED SPRING STEEL

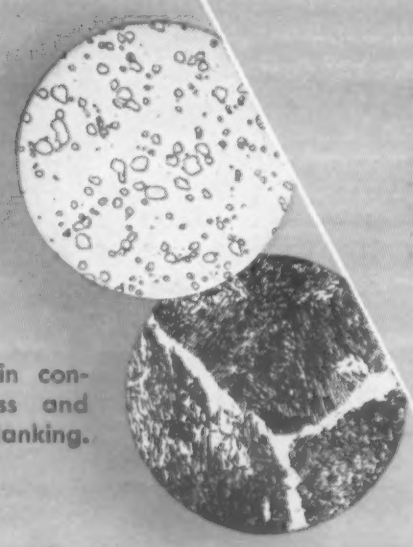
Whether you use cold-rolled spring steel for blanking or for forming, there is a Weirton high carbon strip that simplifies production and holds down costs.

Weirton's close control over every phase of manufacture is your assurance of a consistent balance of desirable qualities and properties. You can depend on Weirton High-Carbon Strip for accurate response to heat treatment—uniformity of gage and width—uniform chemical and physical properties—exact constancy of grain structure—controlled decarburization limits. In other words—Weirton High-Carbon Strip makes good products better, helps you make them more economically.

Weirton High-Carbon Strip is obtainable with the desired chemical analysis and for specific heat treating and hardness ranges, in widths up to seven inches.

SPHEROIDIZED
Annealed, soft and ductile—ideal for cold forming operations.

PEARLITIC
Temper-rolled in controlled hardness and strength for blanking.



WEIRTON STEEL CO.

WEIRTON, W. VA., *Sales Offices in Principal Cities*

Division of **NATIONAL STEEL CORPORATION,** *Executive Offices, Pittsburgh, Pennsylvania*

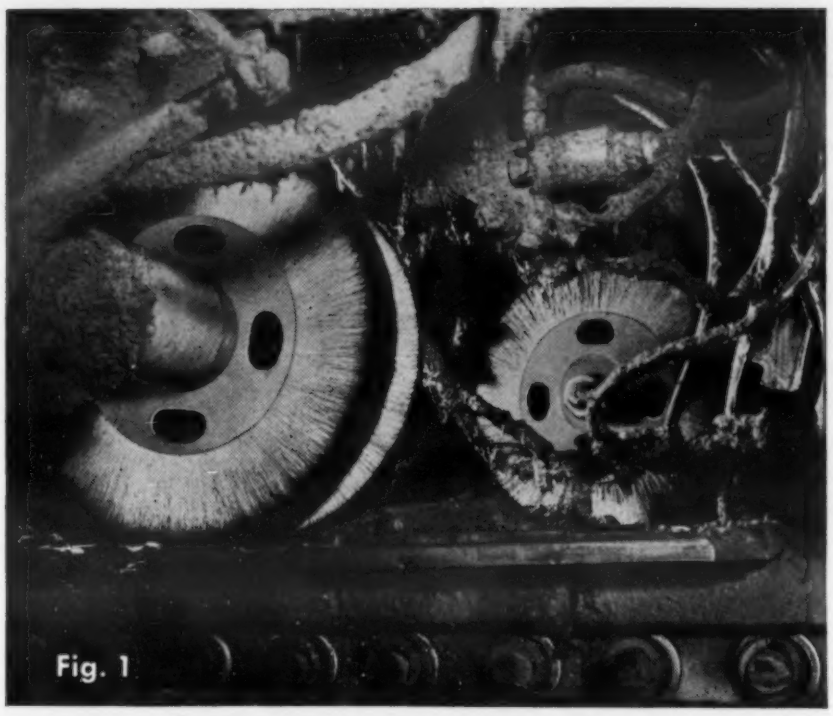


Fig. 1

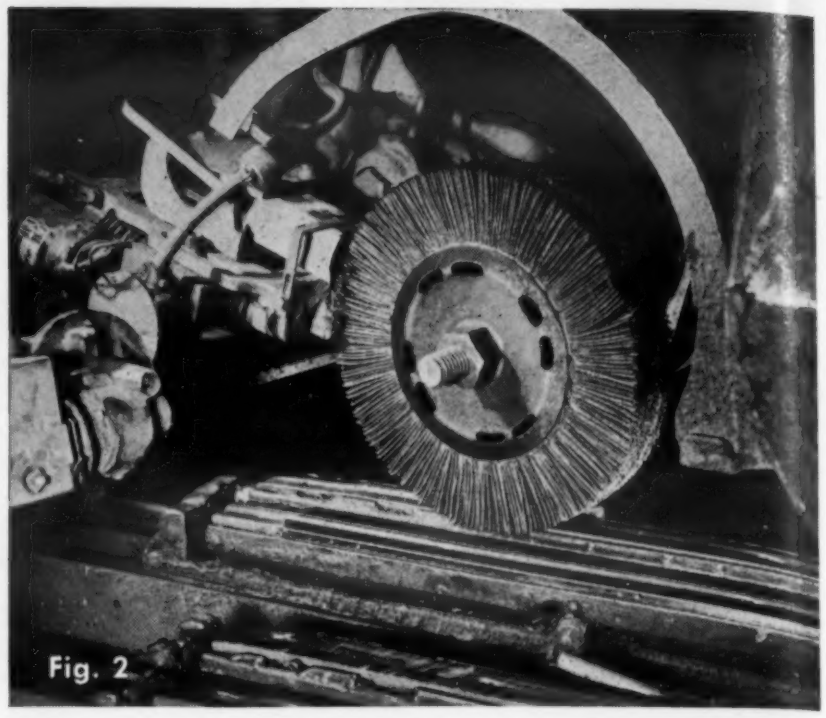
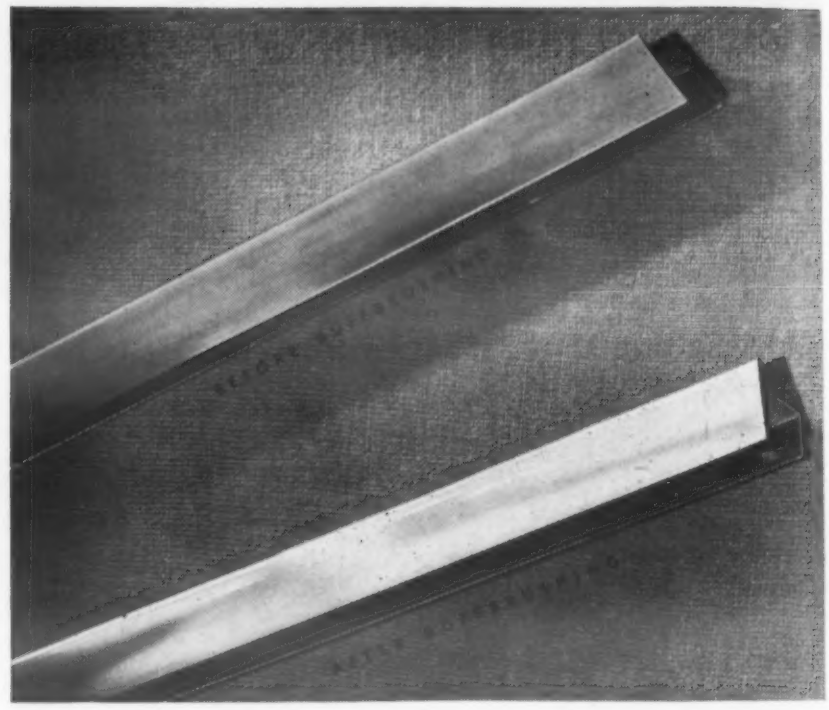


Fig. 2

HERE'S HOW TO CUT COSTS AND GET A BETTER FINISH ON STAINLESS STEEL



NEW OSBORN BUFFBRUSHES* PRODUCE HIGH LUSTRE FINISH ON STAINLESS STEEL PARTS AT FAR LOWER UNIT COST...

TWO types of Osborn Power Driven Brushes remove forming marks and produce the satin-smooth, high lustre finish found on the stainless steel window divider bars used to glamorize motor cars. Here's how it's done.

Divider bar is placed in a holder and moves on a continuous chain through the polishing line. Bar is first brushed by Osborn Monarch® Tampico Power Brushes (Fig. 1), with a spray type abrasive compound, preparing the surface for final color buffing.

Osborn's new power driven Buffbrushes (Fig. 2) and a bar compound complete the polishing operation. Approximately 6500 stainless steel window divider bars are finished by this method per day.

Time and money-saving ideas such as this are the stock-in-trade of Osborn sales engineers. This premium service costs you nothing—*can* save you hundreds, yes, *thousands* of dollars. For complete information, write—

THE OSBORN MANUFACTURING COMPANY

Dept. 219, 5401 Hamilton Avenue Cleveland 14, Ohio

**Osborn Brushes*

**Trade Mark*

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY • POWER DRIVEN BRUSHES • PAINT BRUSHES • MAINTENANCE BRUSHES

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

This "inside story" is doubly hard to tell

You can appreciate the fact that this "inside story" of increased production and cost savings can be hard for us to tell. First, because this RF heating installation is in our own East Pittsburgh plant. Second, because the production increase and savings involved are so great as to appear almost fantastic.

But . . . since we have the facts . . . and can back them up . . . we don't hesitate to tell them to you in order to demonstrate how RF heating can be a real profit booster on *your* production line.

Some time ago, a standard 20-kw, 450-kc, Type C, Westinghouse RF Generator was installed at our East Pittsburgh plant in the department where porcelain terminals are soldered to the tops of capacitor cans. This installation was used to replace the old hand soldering procedure. Careful performance records were kept, and now it is possible to release the following results:

- *Unit production time slashed from 9 minutes to 40 seconds!*
- *Rejects cut from 8% to less than 1%!*
- *Complete installation paid for itself in less than 15 days!*

These are performance figures that speak for themselves. They can speak for *you,* too, on almost any heating or hardening job, with equally dramatic results. Why not let us show you how Westinghouse RF heating can go to work for you?

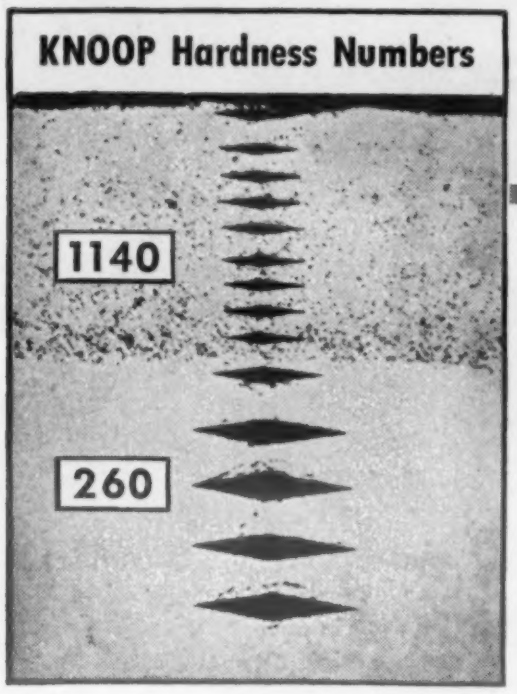
Write direct to Westinghouse Electric Corporation, 2519 Wilkens Avenue, Baltimore 3, Maryland. J-02175

Westinghouse

RF HEATING

TUKON

THE LATEST WORD IN MICROHARDNESS TESTING



100X

Stainless Steel Surface Hardened by the Malcomizing Process of the *Chapman Valve Manufacturing Company.*

TUKON TESTER *for* **KNOOP and 136° PYRAMID HARDNESS NUMBERS**

KNOOP hardness tests were used in developing process for surface hardening stainless steel (type 410). Depth of case 0.010″. The TUKON Tester may also be used for testing thin material, small specimens, small diameter wire and for many kinds of research work. A new booklet contains a collection of up-to-date information about microhardness testing facts, written by actual users of TUKON Testers. **Write for DH-7.**

"ROCKWELL" HARDNESS TESTER

for Laboratory, Tool Room, Production Line

Since 1919, WILSON has kept pace with—even anticipated —the needs of Industry in hardness-testing equipment. There has been constant improvement in existing instruments and development of new ones to meet more exacting requirements.

WILSON MECHANICAL INSTRUMENT CO., INC.

ACCO

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

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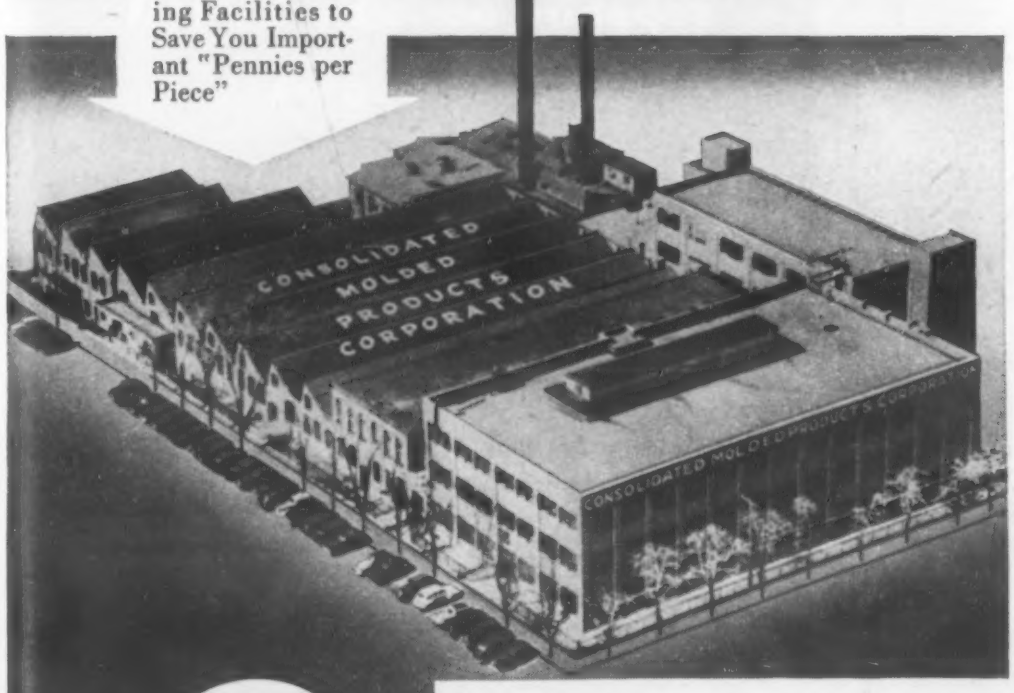
The Price that brings us together will hold us together!

This is Consolidated
A Million Dollars in Custom Molding Facilities to Save You Important "Pennies per Piece"



When we, at Consolidated, submit a quotation, there's conscience and understanding behind it. As a custom molder, we work very closely with the customer—and so does our pricing!

We never lose sight of one very important fact—the piece or product we mold becomes a manufacturing cost to you, and therefor requires that our figures for its preparation and production be kept as low as specifications and good planning permit.

Today, when small pennies saved are again big pennies earned, your plastic product can benefit greatly from a beforehand discussion with Consolidated's sales engineers and technicians. That the types of service we render can advantageously fit your particular requirements, is indicated by the customer-confidence reposed in us by America's foremost manufacturers.

Consolidated is an "all-under-one-roof" control (135,000 sq. ft.)—concentrating upon sound plastic design, economical production, price-and-time savings to the customer. From preliminary sketches, material selections, specifications, estimates—and on through the processes of molding (compression, transfer, plunger, injection) and finishing—ours is the kind of know-how that guarantees your blueprint in plastic—the right plastic—rightly priced!

Experienced Contacting Staff

Call for a Consolidated Sales Engineer. His qualification to sit-in with you stems from having already assisted many manufacturers in properly planning for plastics—profitably! For a get-together that will hold us together, your inquiry is cordially invited.

Please address Dept. E-12

CMP

Your Blueprint in Plastic

Consolidated *Molded Products Corporation*

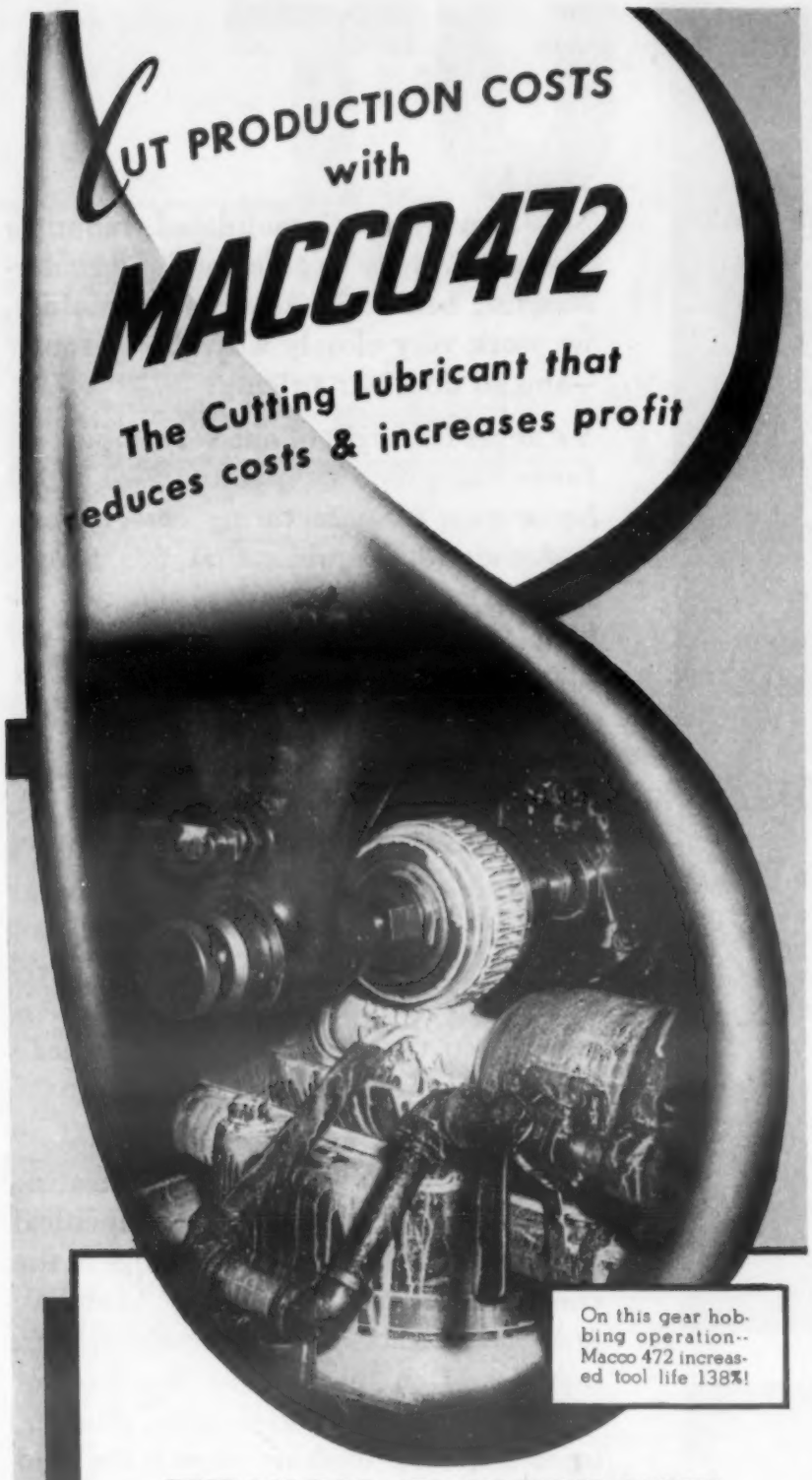
***Plant & Executive Offices:* 309 CHERRY ST., SCRANTON 2, PA.**

Branch Offices and Representatives in* New York, Chicago, Detroit, Cleveland, Bridgeport, Philadelphia—*and other principal cities

CUT PRODUCTION COSTS with

MACCO 472

The Cutting Lubricant that reduces costs & increases profit



On this gear hobbing operation--Macco 472 increased tool life 138%!

TEST MACCO 472 --IN YOUR PLANT

There are dozens of cutting lubricants of various types on the market today. And, perhaps you've already tried a number of them in your plant -- with indifferent results.

But until you actually test Macco 472 -- it will be hard to believe that one lubricant can possibly be so vastly superior to others. However, Macco 472 IS superior -- that's why it's so widely used in so many leading plants.

A test will give you convincing proof that Macco 472 will cut your costs and increase your profits--regardless of the machines you have...the tools you use... or...the metal you process.

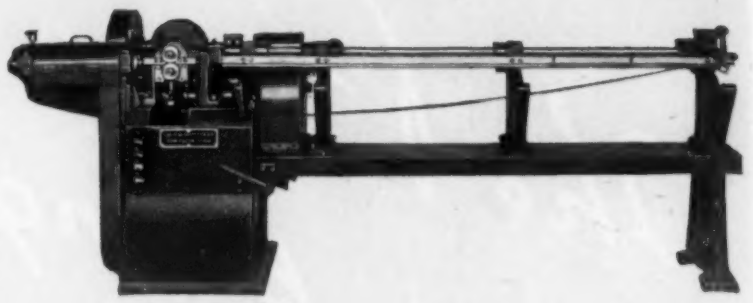
If you will make the test, we will gladly supply the Macco 472--no charge or obligation. How about it?

Send for this new illustrated folder filled with facts on Macco 472.

MACCO
PRODUCTS COMPANY
525 WEST 76TH STREET • CHICAGO, 20, ILLINOIS

SHUSTER

WIRE STRAIGHTNERS



Shuster Wire Straighteners are available for wire .025 to 11/16" diameter.

- Almost continuous wire travel
- Lightning cut-off assures square-cut ends
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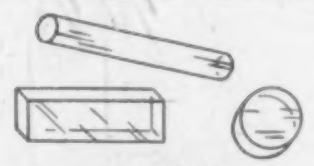

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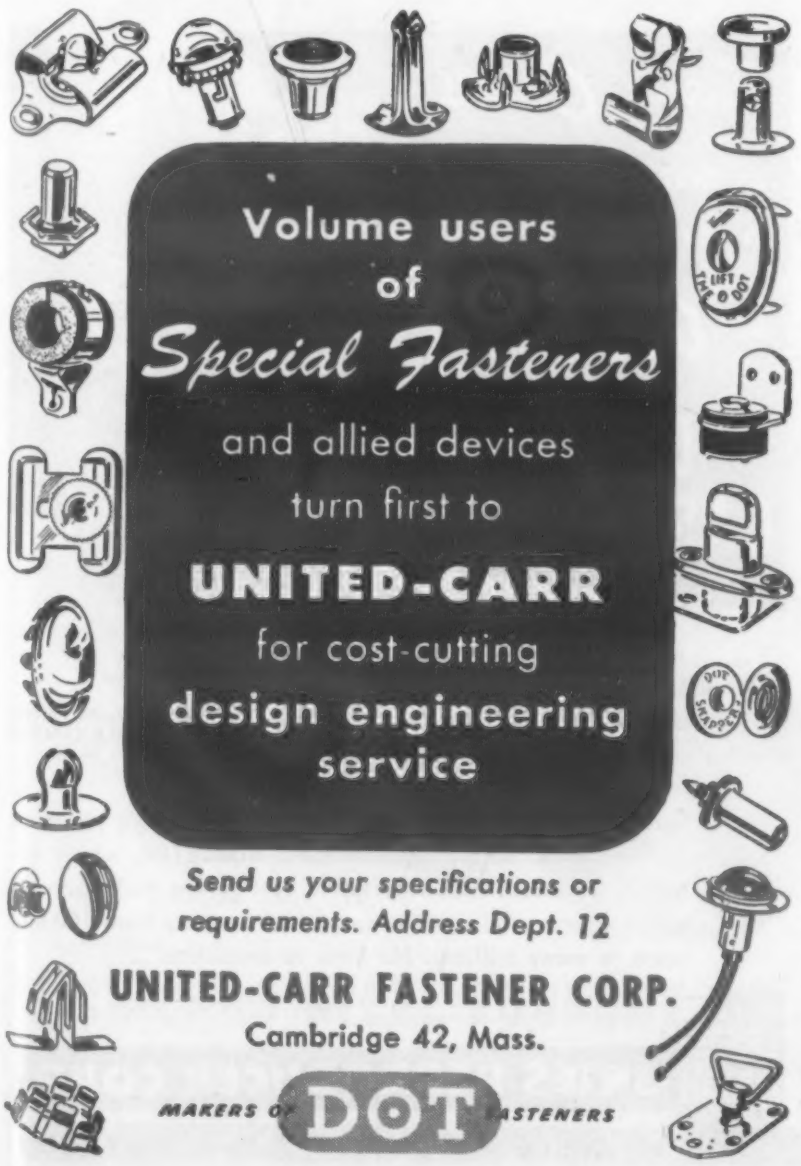

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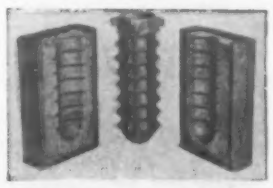

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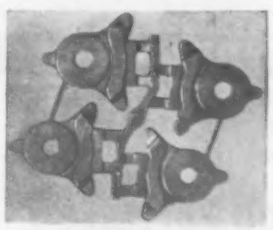

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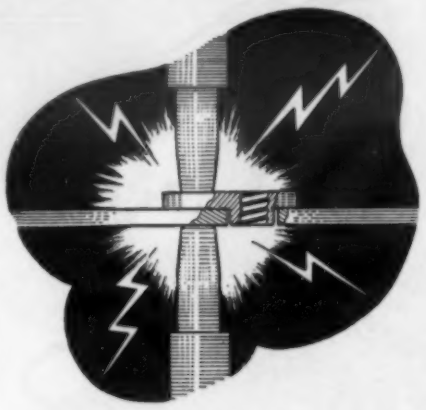

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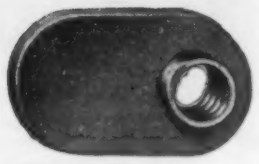

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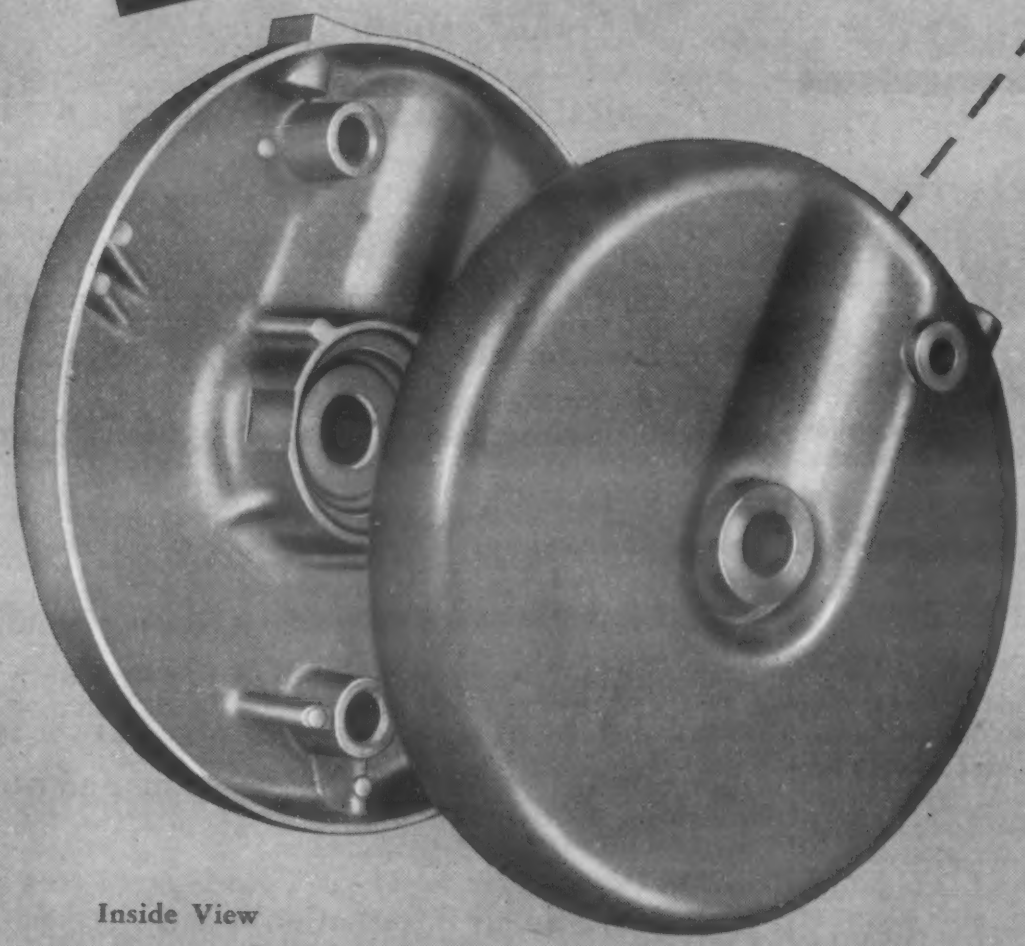

Inside View

Outside View

The front brake side plate on this popular new motorcycle is an excellent example of the plus values which designers can so often get in Madison-Kipp die castings. The high strength, accuracy, and functional bosses and recesses are inherent values. The lightness and the eye appeal are extra values.

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JOHNSON BRONZE

SLEEVE BEARING DATA

Bearing TYPES

JOHNSON BRONZE

SLEEVE BEARING DATA

Graphited Bronze Bearings

GRAPHITED SLEEVE TYPE BEARINGS were developed primarily for applications where lubrication is difficult, likely to be neglected and where the speed of the shaft is too slow to sustain an oil film. They are also used in some applications where ordinary lubricants might damage goods or food products in process and where temperatures are too high for oil or grease.

There are three fundamental types available: cast bronze with serrated grooves, cast bronze with graphite plugs and bronze sheet metal with serrated, rectangular or diamond shape indentions.

In the cast bronze serrated type, minute, dovetailed grooves are cut into the bearing surface at a 7 degree lead. Graphite is then compressed into these serrations and remains permanently in place. This type provides from 40 to 45% graphite contact with the shaft which increases slightly with wear.

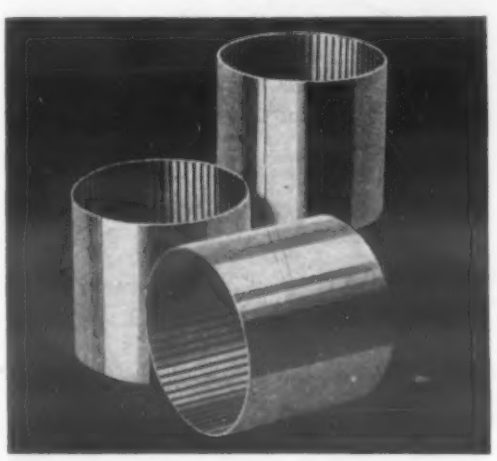
· · · Serrated type graphite bearing. Note the 7° lead and the dovetail shape of the serrations.

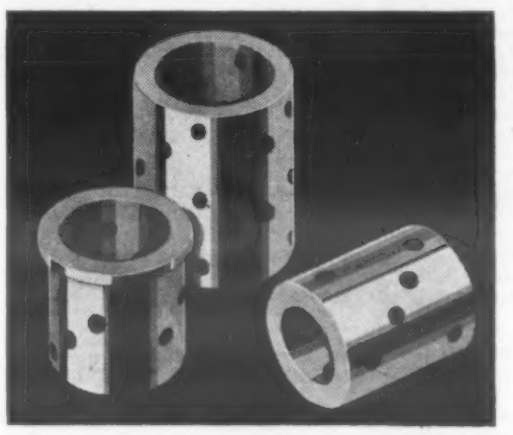
Plug type graphited bearings are produced by drilling holes of a suitable size in a cast bronze bearing on a staggered pattern through the wall. Stick graphite is then forced into these holes and remains permanently in place.

In some applications, ordinary oil grooves or combinations of oil grooves can serve as recesses to hold the graphite. It is also possible to compress graphite into grooving on the flange of cast bronze bearings when the application requires it.

The first step in producing bronze sheet metal graphited bearings is to cut serrations longitudinally into coiled strips of sheet bronze. The graphite is then forced into these serrations by a high pressure, patented process and baked under a carefully controlled temperature. The strip material is then blanked and formed into cylindrical shapes. In producing the cylindrical shape the serrations automatically become dovetailed which holds the graphite permanently in place.

Cast graphited bearings can be reamed in place, a maximum of 0.005 stock being removed. Sheet metal bearings *must* be burnished in place. The graphite used in Johnson bearings is not soluble in water, oil or gasoline. An occasional application of oil or grease where permissible will greatly increase the life of the bearing and lower the coefficient of friction. Cast graphited bearings are recommended for applications having slow speeds and minimum loads. For intermittent service or oscillating motion we recommend sheet metal with graphite. Quantity is a factor also and in large production runs of any given size, sheet metal is surprisingly low in cost.





Limiting Factors For Successful Performance

1-Speed—Load Factors:

(a) For constant running shafts—PV=18,000# in (min.) sq. in. proj. area.

(b) For constant running shafts (with supplementary lubrication) PV=120,000# in (min.) sq. in.

(c) For Oscillating shafts—PV=60,000# in (min.) sq. in.

(d) Intermittent service—PV=120,000# to 250,000# in (min.) sq. in. (use safety factor)

2-Bearing Pressures:

(a) All graphite jobs (without additional lubrication) 40 to 50# sq. in. (for speeds of 30 ft. per min.)

(b) With supplementary lubrication 350# sq. in.

3-Temperatures:

(a) Standard graphited bushings—Satisfactory up to 250° F. 275° F. (Using conventional leaded bronzes and serrated type.)

(b) For temperatures up to 400° F. Conventional leaded bronzes with graphite plugs.

(c) For temperatures—Up to 1000° F. Special lead bronze alloys with graphite plugs. At higher loads, oil should be used in conjunction with the graphite plugs for higher efficiency.

4-Running Clearances:

(a) Constant running shafts—50% higher than standard.

(b) Oscillating shaft—Standard allowance can be used.

5-Wall Thickness:

Minimum thick.
1/16" for O.D. up to 1".

Minimum thick. Serrated type
3/32" for O.D. over 1".

Max. wall thick.—Optional to designer. For plug type graphite—wall to be same as diameter of graphite plug—⅛ min.

6- Graphited bushings should be recommended for speeds less than 30 ft. per min. for at such low speeds it is impossible to develop film pressure necessary to prevent metallic contact.

7-Stock Allowance for finishing

(a) It is necessary to finish bushing in assembly. Reaming stock allowance of not more than 0.005 should be allowed for cast bronze graphited.

(b) At least 0.004 stock for burnishing sheet metal graphited.

Ledaloyl Bearings

While graphited bearings are sometimes referred to as "Self-Lubricating" Johnson Bronze produces another type by powder metallurgy known as *Ledaloyl*. This bearing is low in cost, high in efficiency and holds up to 35% oil by volume. It is particularly economical when produced as a self-aligning, flanged or other odd shaped part as there is no machining required. Write for complete details.

●

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Ajax Electric Furnace Corp. 124, 126, 148
Ajax Electrothermic Corp. 124, 126, 148
Agency—W. L. Towne Advertising
Ajax Engineering Corp. 124, 126, 148
Agency—Broomfield-Podmore Advertising
Ajax Metal Co. 124, 126, 148
Allegheny Ludlum Steel Corp. 35
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Allied Chemical & Dye Corp. 136
Allied Research Products, Inc. 90
Agency—Emery Advertising Corp.
Aluminum Co. of America 93, 123
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American Brake Shoe Co. 10
American Brass Co. 6, 7, 15
Agency—Kenyon & Eckhardt
American Chain & Cable Co., Inc. 134
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American Felt Co. 117
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American Gas Furnace Co. 146
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Ames Precision Machine Co. 148
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Arwood Precision Casting Co. 165
Agency—J. C. Dillon Co.

Babcock & Wilcox Co. 84
Agency—Michel-Cather, Inc.
Bakelite Corp. 33, 34
Agency—J. M. Mathes, Inc.
Baldwin Locomotive Works 139
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Barrett Division 136
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Beryllium Corp. 92
Agency—Beaumont, Heller & Sperling, Inc.
Bethlehem Steel Co. 16, 103
Agency—Jones & Brakeley, Inc.
Bound Brook Oil-Less Bearing Co. 114
Agency—Franklin Fader Co.
Bridgeport Brass Co. 24
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Carlson, G. O., Inc. 120
Agency—Renner Advertisers
Carnegie-Illinois Steel Corp. 25
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Cerro de Pasco Copper Corp. 163
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Continental-Diamond Fibre Co. 105
Agency—Beaumont, Heller & Sperling, Inc.
Crucible Steel Co. of America 29
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Cullen-Friestedt Co. 146
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Distillation Products, Inc. 37
Agency—Griswold-Eshleman Co.
Doehler-Jarvis Corp. 131
Dow Chemical Co. 119
Agency—MacManus, John & Adams, Inc.
Dow Furnace Co. 135
Agency—Tech Agency, Inc.
Drop Forging Association 100
Agency—Lee Donnelley Co.
du Pont, E. I., de Nemours & Co., Inc. 143, 149
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Duraloy Co. 104
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Durez Plastics & Chemicals, Inc. ..... 2nd Cover
Agency—Comstock, Duffes & Co.

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Eclipse-Pioneer Division Foundries of Bendix Aviation Corp. 127
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Electric Furnace Co. 142
Agency—Henry T. Bourne Advertising Agency, Inc.
Electro-Alloys Div. 10
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Federated Metals Div. 22
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General Electric Co., Apparatus Dept. 8, 9, 26, 94, 96
Agency—G. M. Basford Co.
General Electric Co., Chemical Dept. 121
Agency—Benton & Bowles, Inc.
Goodrich, B. F., Chemical Co. 14
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Graphite Metallizing Corp. 144
Agency—Kotula Co.
Gray Iron Founder's Society, Inc. 18
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Gray-Syracuse, Inc. 150
Gries Reproducer Corp. 164
Agency—Harold Marshall Advertising Co.

Harper Electric Furnace Corp. 144
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Harper, H. M., Co. 19
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Hassall, John, Inc. 97
Agency—Anderson, Davis & Platte, Inc.
Hayes, C. I., Inc. 145
Agency—Thorndike-Hoen Agency
Holliday, W. J., & Co. 130
Agency—Tri-State Advertising Co., Inc.
Houghton, E. F., & Co. 142
Agency—Van Diver & Carlyle, Inc.

Industrial Products Div., Elgin National Watch Co. 162
Agency—Waldie & Briggs, Inc.
Inland Steel Co. 2
Agency—Fensholt Co.
International Nickel Co., Inc. 5, 32, 107, 155
Agency—Marschalk and Pratt Co.

Johns-Manville Corp. 36
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Kennametal, Inc. 160
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Lindberg Engineering Co. 141
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Linde Air Products Co. 118
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Agency—Ad-Pro Co.

Macco Products Co. 162
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Madison-Kipp Corp. 166
Agency—Buchen Co.
Mahon, R. C., Co. 17
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Meehanite Metal Corp. 89
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Monsanto Chemical Company, Plastics Division 27
Agency—Gardner Advertising Co.
Morganite, Inc. 106
Agency—George Homer Martin Associates
Mueller Brass Co. 157

National Steel Corp. 115
National Tube Co. 25
Agency—Batten, Barton, Durstine & Osborn, Inc.
New Jersey Zinc Co. 156
Niagara Alkali Co. 109
Agency—Hazard Advertising Co.

Oakite Products, Inc. 150
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Ohio Crankshaft Co. 21
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Ohio Nut & Bolt Co. 164
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Phoenix Products Co., Metal Spinning Div. 156
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Pittsburgh Lectromelt Furnace Corp. 108
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Powdered Metal Products Corp. of America 125
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Reinhold Publishing Corp. 171
Republic Steel Corp. 13
Agency—Meldrum & Fewsmith, Inc.
Revere Copper & Brass, Inc. 38
Agency—St. Georges & Keyes, Inc.
Reynolds Metals Co. 95
Agency—Griswold-Eshleman Co.
Ryerson, Joseph T. & Son, Inc. 42
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Agency—Comstock, Duffes & Co.
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United-Carr Fastener Corp. 163
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United States Steel Corp. 25
Agency—Batten, Barton, Durstine & Osborn, Inc.
United States Steel Export Co. 25
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United States Steel Supply Co. 31
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Vanadium Corp. of America 159
Agency—Hazard Advertising Co.

Watertown Mfg. Co. 138
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Westinghouse Electric Corp. ..... 3rd Cover, 133
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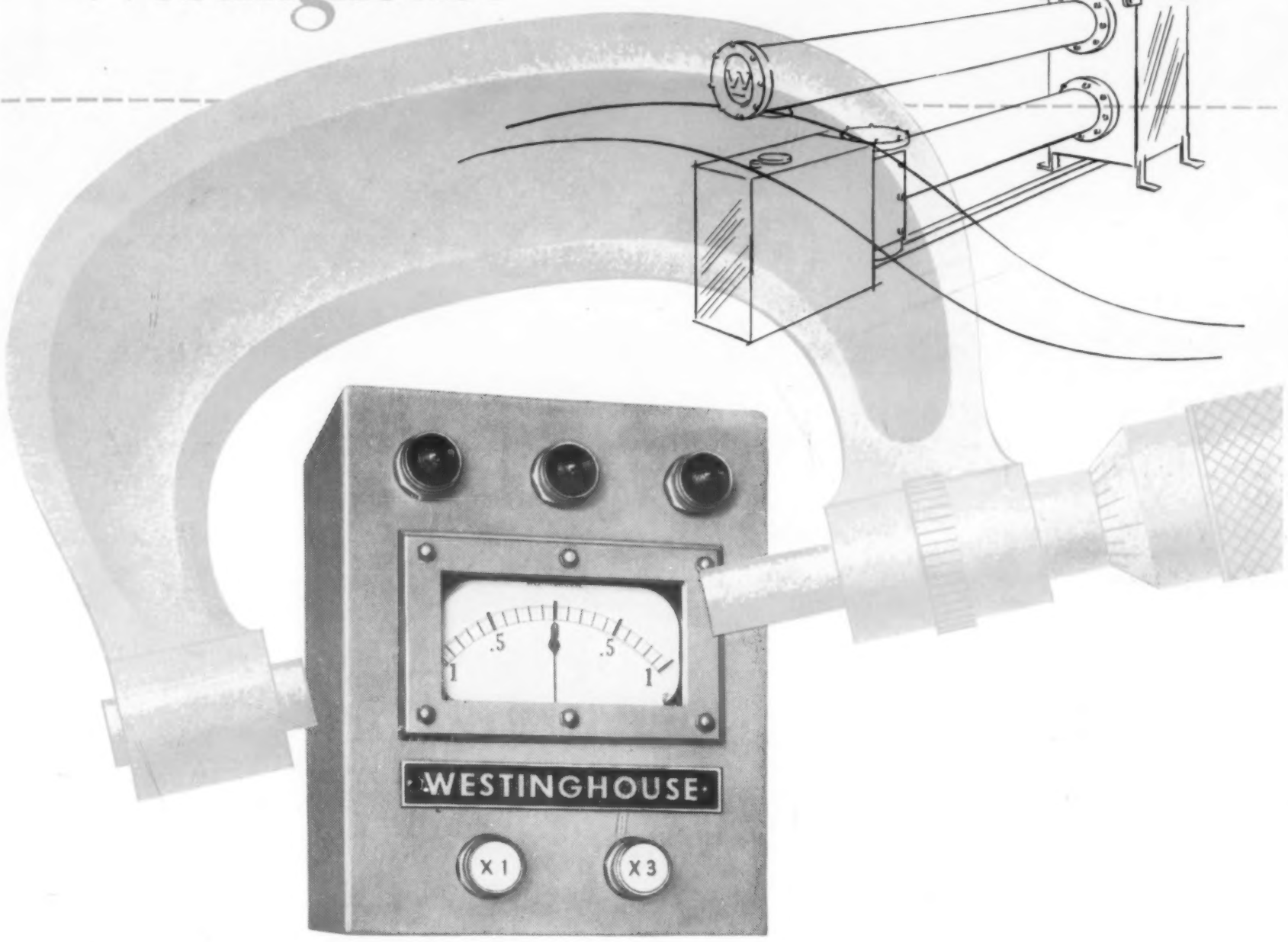

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. . . with this X-RAY Thickness Gauge

Facts speak for themselves where quality and economy are dependent upon *rigorously* keeping to thickness standards. Compare the Westinghouse X-Ray Thickness Gauge with your present method of gauging the steel strip on high-speed, cold reduction mills or slower classification lines. It's FASTER . . . employs the direct comparison method of gauging which is independent of strip speed, yet holds to minute tolerances. It's FOOLPROOF . . . no mechanical gauging wheels to maintain . . . no contact between gauge and sheet . . . no damage to strip surface. It's POSITIVE . . . no manual handling of calibration samples . . . operation and calibration of the gauge are handled by remote control from the operator's control panel. And above all, it's ACCURATE . . . tolerances are maintained to within ± 2% . . . variations show up immediately on the indicating meter shown above, or may put reject gates into operation.

Consider these time and moneysaving "extras", too:

- Rugged mechanical construction and complete circuit stability which prevent costly shutdowns.
- No loss of time for setups . . . each new run can be set up rapidly and easily.
- Easy installation for lateral strip scanning.

You've been asking for a thickness gauge like this . . . and now it's here! Controlled accuracy that insures quality and assures economy. Your local Westinghouse representative can give you all the facts today. Call him or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-08227

Westinghouse

X-RAY

How to get UNIFORM quality in your stainless steel forgings

UNIFORM quality in your forgings has to start at the beginning —with the bars you use.

Timken® stainless steel forging bars give you high surface and internal quality that's *uniform* from bar to bar and from heat to heat. You can depend on uniform physical and chemical properties from shipment to shipment. Forgeability is consistent. Costs are cut through fewer rejects, delays and changes in shop practice.

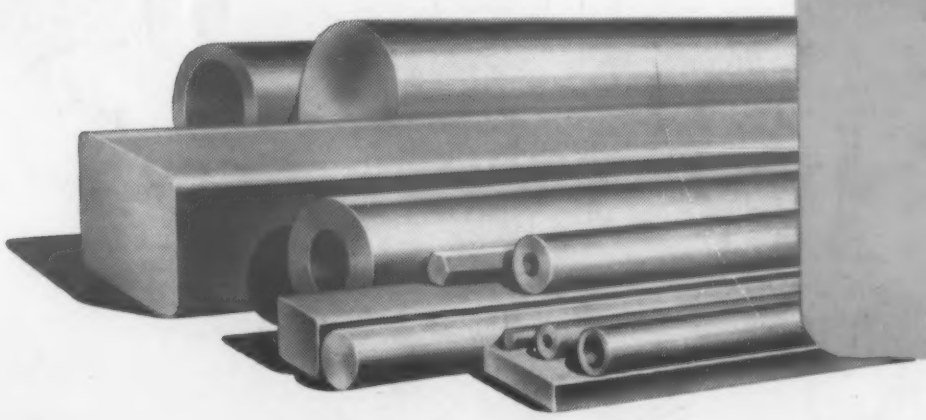
Another big advantage of stainless steel forgings made from Timken forging bars is their uniform machinability—always fast, easy, with a smooth finish.

You can count on uniform quality in Timken stainless steel forging bars because quality is completely and rigidly controlled by The Timken Roller Bearing Company throughout manufacture.

For help with your problems, write our Technical Staff, leading authority on stainless steels. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, O. Cable address: "TIMROSCO".

TIMKEN 1899 50 YEARS 1949

50th birthday of the company whose products you know by the trade-mark: TIMKEN



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TRADE-MARK REG. U.S. PAT. OFF.

Fine Alloy

STEEL

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Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing